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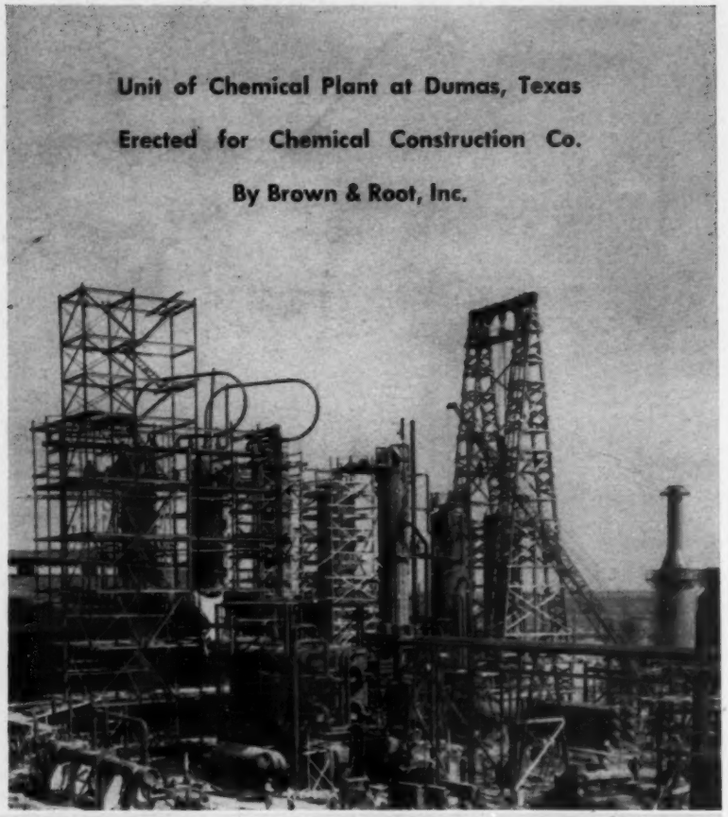

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One Mile Pier to Location In Gulf by Brown & Root, Inc.

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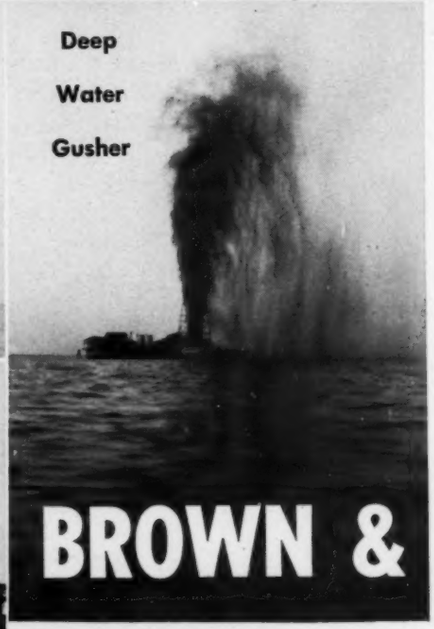

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WORLD PETROLEUM

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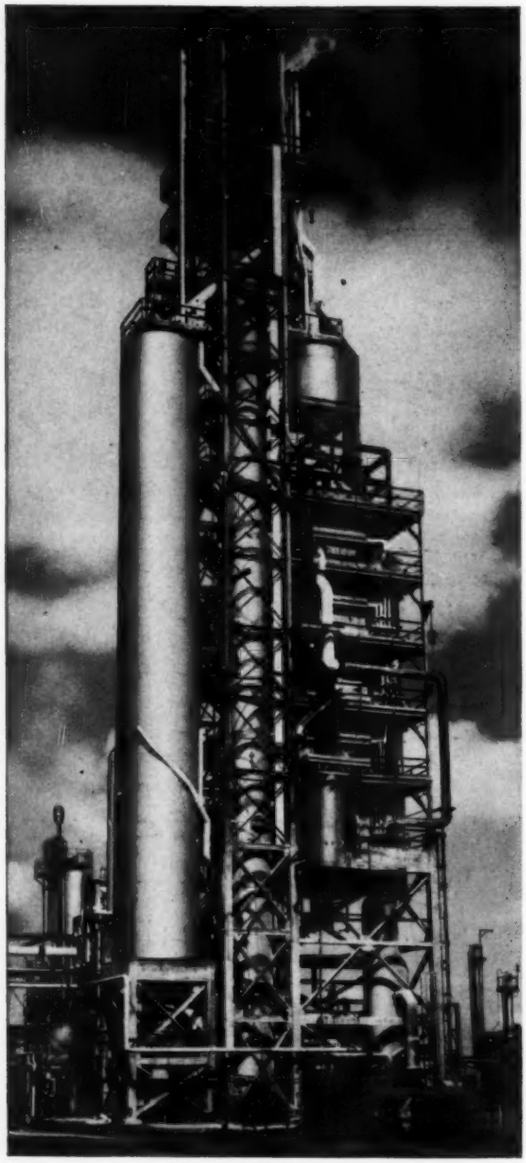
This Month's Cover

Front cover: Workmen cleaning the somastic coating machine on the San Joaquin valley pipeline of Standard Oil Co. of California.

New Leonard 3,000 B/D TCC unit now on stream!



FIRST POST-WAR SMALL-SCALE CATALYTIC CRACKER WAS COMPLETED 6 MONTHS AFTER BREAKING GROUND

On March 18, only six months from the time ground was broken, a new 3,000 b/d TCC unit went on stream at Leonard Refineries, Inc., Alma, Michigan and its markedly successful operation is being noted with interest by the entire refining industry.

It is significant that this progressive, rapidly expanding refinery selected TCC equipment for its entry into catalytic cracking. For this new small TCC is the first post-war catalytic cracker specifically designed to meet the competitive needs of the small refiner. Compact but complete, it includes all the essentials of cat crackers many times its size. Yet it is actually simpler, with an integral elevator design so that only one elevator is required for both spent and regenerated catalyst.

Houdry will gladly discuss details of this small TCC with other interested refiners.

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EDITORIAL

RISING DEMAND POSES PROBLEMS FOR INDUSTRY

DURING the past month of May daily crude oil production in the United States exceeded five million barrels for the first time in history. Yet this record performance did not allay the widespread concern within the industry as to the prospect of a tightening supply situation as the year advances, with a repetition of the spot shortages previously encountered and the possibility of a fuel scarcity by the end of the year.

Anxiety on this score has mounted steadily since the first of the year, as demand has increased and stocks have diminished at more than seasonable rates. During the very week when the top record for well output was established, stocks of finished products decreased by more than a million barrels. For the first quarter of the year the Bureau of Mines had forecast a gain of 3.3 percent in the demand for products as compared with the corresponding period of 1946, but the actual increase was nearly 13 percent. The increase applied to all principal products but was most pronounced in the case of distillate fuels, a result attributed in part to the unseasonably cold weather in many sections of the country which led to a higher than normal consumption of fuel oil for household heating. This, however, could have been no more than a minor factor, and it is noteworthy that both the domestic and export demand for light fuel oil rose in approximately equal proportions. With supplies from all sources including imports aggregating 5,580,000 barrels daily against the movement of 5,840,000 barrels into channels of consumption, withdrawals from stocks averaged 260,000 barrels per day.

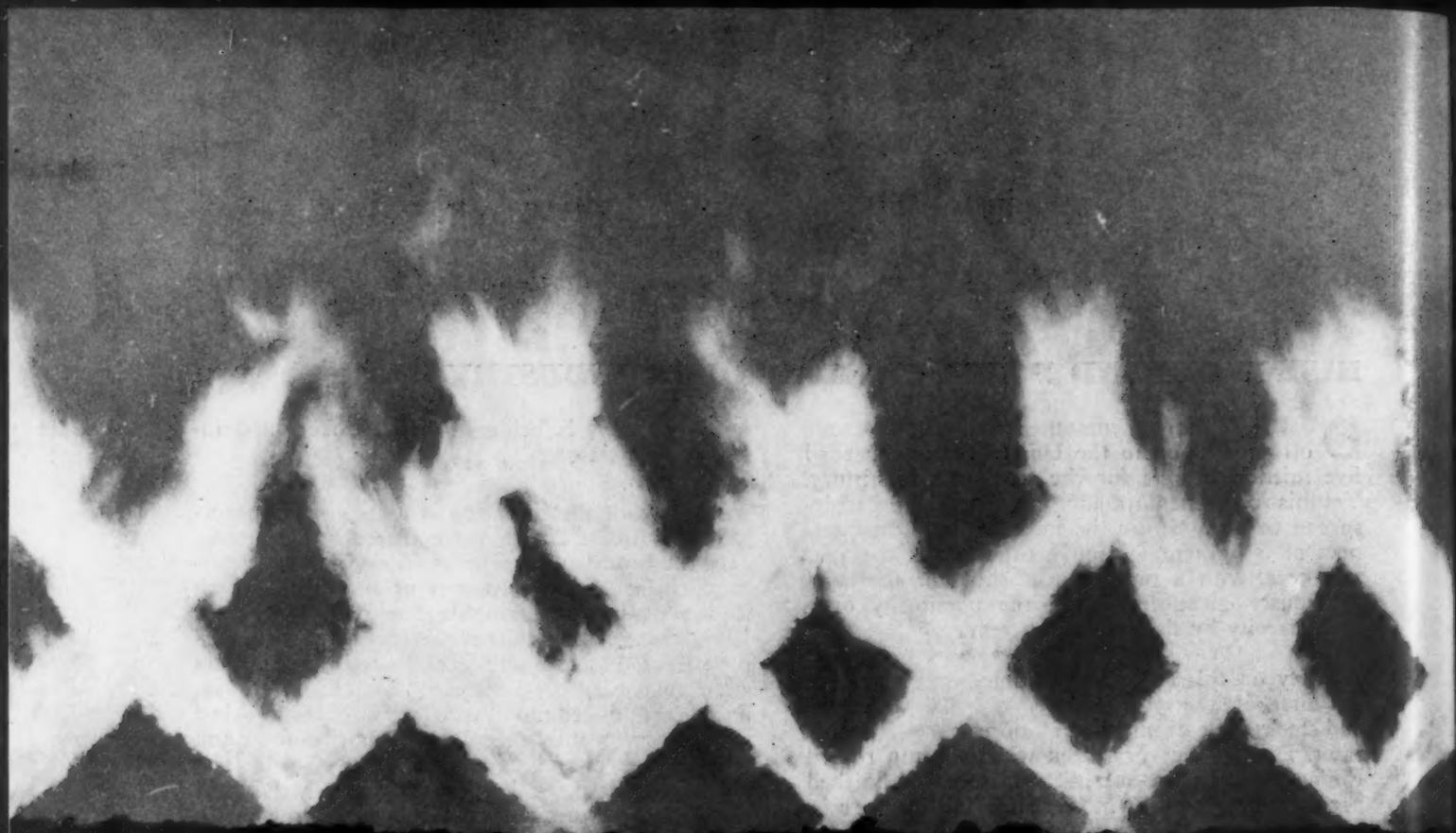
With stocks declining and no indication of a let-up in market activity, a revision of estimated requirements is in order. The Bureau of Mines now calculates the rise in demand over last year at six percent, which would bring daily needs up to 5,640,000 barrels. Industry economists are inclined to place the figure somewhat higher, at 5,700,000 to 5,800,000 barrels daily.

It is not merely the prospect of an unprecedented demand for products that causes worry among oil men but a combination of circumstances that presents unusual difficulties in satisfying all requirements. Although total domestic crude output is at an all-time high, the major part of the gain has come from West Texas, and many refiners are not in a position to obtain access to this source of supply. Thus spot shortages arise even among Gulf Coast refiners who do not possess production of their own. Purchasers for export find difficulty in making up lots for shipment, and a brisk premium business is being done by brokers and individual operators.

Tied in with this situation is a lack of transportation facilities. The shortage of steel which handicaps the industry in many of its operations is particularly acute in the matter of line pipe, which is practically unobtainable for delivery before 1949. This is delaying the construction of projected pipe lines, both for crude and products. It poses a problem of special concern for midwestern refiners and distributors who were hard put last season to meet the demands of their customers and who foresee even greater difficulties ahead. It is noteworthy that, while formerly the activity in pipe line construction was largely concerned with the building of systems to connect producing fields with Gulf Coast refining points, some of the largest projects now on the boards are for products lines extending from the Coast to the central and western states, but none of these can be completed in time to ease the situation during the current year. Nor can relief be looked for from the substitution of rail transportation. Scarcity of steel has prevented the replacement of the thousands of tank cars worn out by hard service during the war, many of which have been converted into much-needed scrap.

Not least of the industry's worries is that of refining facilities to fill the rising requirements for petroleum products. Most of the larger oil companies and several of the smaller ones have approved plans either for the expansion of existing facilities or the erection of new plants, but such construction can have little if any effect on this year's operations. Some of the projected plans suggest a partial reversal of the historic trend which has carried the refining industry westward and southwestward across the country and point to the establishment of more extensive facilities along the Atlantic Coast. Possibly the reasoning is that such locations may prove advantageous in case it becomes necessary to supplement available domestic supplies by larger imports from abroad. For the present, however, lack of available tankers seems to preclude any considerable addition to imports.

Members of the oil industry are alive to their responsibility in supplying the public and the government with all needed requirements in the way of petroleum products. The fact that prospective needs which always grow heavier toward the end of the year are being studied now is perhaps the best assurance that some means of satisfying them will be found.



LANDING AIDS TESTS POINT WAY TO INCREASED SAFETY IN FLYING

Crossover type burners operated with gasoline form an eight-foot wall of flame releasing six million Btu. per yard per hour.

SPEAKING before a marketing committee of the American Petroleum Institute in April last, General James H. Doolittle, vice president of Shell Union Oil Corporation, described the present status of commercial aviation in the United States in the following words:

"Today the prime need of all aviation is more and better airports. For the national good and for the good of our industry, we oil men must be leaders in encouraging the development of a sufficient number of properly equipped airports to adequately serve every section of our country. If aviation is to achieve the great economic and social benefits which are possible of attainment, its advantages must be available to all.

"The second deterrent to the development of aviation, and the greatest obstacle in the way of increased safety and regularity, is the inadequacy, or absence, of essential aids to navigation and bad weather landing aids. The necessary equipment has been developed and proved, but must be purchased and installed.

"Last year in comparison with 1945, scheduled airlines carried twice as many passengers twice as far in twice the number of planes, and they did it twice as safely. There were 75 passenger fatalities or 1.2 passenger fatalities per 100 million passenger miles—a safety record which the railroads took 60 years to accomplish and which is more than twice as good as the 2.8 passenger fatalities per 100 million miles in automobiles during the period of 1943, 1944 and 1945. Three quarters of the accidents which did occur were the result of running into mountains or cracking while attempting to land under bad weather conditions. With aids to navigation, now available but for the installation, these accidents could have been avoided and commercial air transport would have been four times as safe as it was."

This analysis of conditions affecting commercial aviation and the problems confronting it is one that is concurred in by those who have given special study to the subject. The greatest deterrent to air travel and the cause of heaviest losses to aviation companies arise from irregularities in service due to adverse weather conditions. Delays in takeoffs and landings, diversion of planes from their scheduled routes and cancellation of flights are not merely annoying to travelers and costly to operators, but the conditions responsible for them add to the hazards of air travel. A single transcontinental air company estimated its losses in passenger revenue and expenses arising from flight cancellations during 1946 at $2,500,000. As its operations are typical of most of the larger lines, it is evident that the aggregate cost to all country's air services on this same score may easily amount to $25,000,000 or more in the course of a year.

As Gen. Doolittle pointed out in the statement quoted above, the means of overcoming many of the conditions that cause interruptions of air traffic are known and need only to be applied to existing airports. The military necessity of maintaining all-weather flights during the war led to the development of various landing aids that proved their usefulness at the time and that can

be adapted to commercial aviation with some possible modifications.

Practical tests of these various devices for promoting the safety and regularity of air navigation were begun during the war by the United States Navy and have been continued since its close at the Landing Aids Experiment Station at Arcata, California, north of San Francisco near Eureka. The site was selected for a reason. As is well known, fogs are frequent along the Pacific coast. The Aleutian current which flows eastward across the north Pacific is deflected southward as it approaches the American shoreline and forms a belt of cold water which is known as the California current. The westerly flow of heated air prevalent during the summer months encounters the colder atmosphere above the current which chills its lower strata, creating heavy advection fogs. Meteorologists explain that there are certain upwellings or cells in the course of the current and that the strongest of these is almost directly opposite the location of the station, giving it an exceptionally high incidence of fog and making it particularly well suited to the testing of fog-dispelling devices. Heavy winter rains, moreover, provide ample opportunity for the study of other navigational aids in all types of weather.

Upon recommendation of the Bureau of Aeronautics of the Navy, the Arcata station was set up primarily for testing various systems of fog dispersal that had been used in England during the war and that were known collectively under the name of FIDO, the initials originally signifying "Fog, Intensive Dispersal of." The work of construction was begun in March, 1945, by Navy Seabees, and during the following summer most of the needed equipment was installed. Runways had been completed, pipe lines laid, a pumping station and storage tanks constructed.

After the end of the war the Navy decided to deactivate the station, but in view of the importance of the work it was designed to do and in order to make use of the facilities that had been established, a program was adopted for continuance of its activities under the joint sponsorship of the Army Air Forces, the Bureau of Aeronautics, the Civil Aeronautics Board, the Civil Aeronautics Administration and the Air Line Pilots Association. Funds were administered by the Bureau of Aeronautics which was authorized to contract with a civilian organization to manage the project. The managership was first undertaken by the University of Southern California, and when it withdrew in June, 1946, the task was taken over by United Air Lines until the end of its contract on January 31, 1947.

Termination of the war released the security restrictions that had previously cloaked the use of blind landing equipment and stimulated widespread interest in the subject on the part of commercial and private fliers who were concerned with learning about possible applications, not only of fog dispersal systems but also of ground control approach, instrument landing systems and new approach and runway lighting methods that had been applied more or less effectively during the war period. The sponsors of the Arcata Experiment Station decided, therefore, that it was desirable to expand its scope to cover the development and testing of all types of landing aids. Accordingly changes were made in the landing field itself, and a large amount of new equipment was installed in preparation for the tests to be run during the 1946 season of heavy fogs.

A Bartow Type D-1 runway marker light was installed along the instrument runway which involved the laying of 12,000 feet of conduit and the pouring of 72 concrete light bases. A new type of lighting was provided in the approach zone requiring 7,000 feet of conduit, the erection of 36 steel towers varying in height from seven to 84 feet and the installation of a 600-KW portable generator and 36 individual transformers. A special wide-angle, high candle-power approach light was added.

An important change in the fog dispersal equipment was the introduction of a high pressure system developed by Babcock & Wilcox Company. Earlier FIDO installations used by the military during the war employed low-pressure burners which required a considerable pre-heating period before the flame became effective and in which aviation fuel or other high-test gasoline was used. The expense involved in the heavy consumption of such fuel was a minor consideration under war conditions but is an important factor in commercial use. The new high-pressure system employs a different principle of combusion in which fuel is prepared by atomization instead of vaporization. This avoids the smoke which was a drawback to the earlier methods, makes possible immediate combustion and permits the use of heavier petroleum fractions such as diesel fuel to be burned.

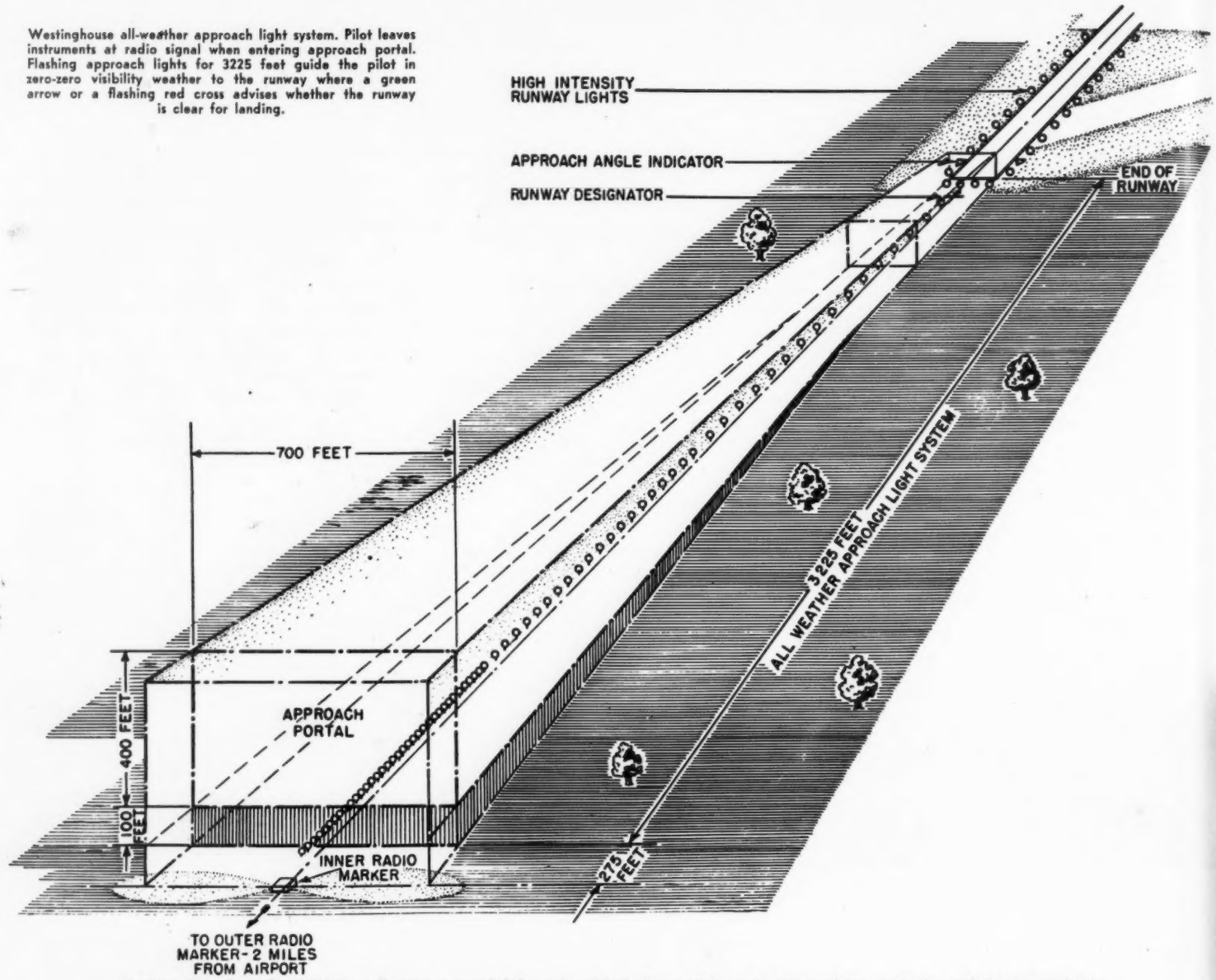
At the Arcata station four Carter pumps operated by gasoline engines deliver fuel from the tanks to the high-pressure intake. The high-pressure pump, built by the Byron Jackson Company, is of centrifugal type with nine compression stages and discharges 840 gpm at pressures up to 1850 psi. It is operated by an 800 hp General Electric induction motor. Along the burner lines, riser pipes are welded to the supply lines. These are equipped with burner heads carrying one to three burner nozzles to meet varying flame requirements. Ignition is accomplished automatically with GE calrod heating elements. Remote control of the system is obtained by using solenoid valves which permit its operation to be adjusted to any set of weather conditions.

Under this system fog dispersal begins more promptly, proceeds more rapidly and involves much less expense for fuel than was the case with the earlier wartime installations. Fuel requirements naturally vary greatly with the severity of fog conditions. At Arcata the cost under moderately heavy fog varied from $35 to $40 per landing. In a study made for a municipal airport, it was estimated that under the most severe fog conditions 630 gallons of fuel per minute would be consumed to maintain a continuous 200-foot ceiling. With landings at two-minute intervals, this would amount to approximately $80 per landing. Higher ceilings can be maintained, but costs rise rapidly.

It so happens that some of the country's most important airline terminals are subject at cer-

LAES test plane equipped with latest landing aids.

Westinghouse all-weather approach light system. Pilot leaves instruments at radio signal when entering approach portal. Flashing approach lights for 3225 feet guide the pilot in zero-zero visibility weather to the runway where a green arrow or a flashing red cross advises whether the runway is clear for landing.



American Gas Accumulator 25,000 candlepower approach lights with red lucite lenses visible under fog conditions at Landing Aids Experiment Station.

tain seasons to fogs which lie close to the ground, reduce visibility practically to zero and sometimes last for hours or even days. In such locations the thermal process is the only efficient method of dispersal yet available, and its installation is justified by the savings it makes possible in commercial operations. Where fog is not experienced or is a rarity, this particular equipment may not be necessary, but other landing aids are essential to cope with bad weather. Even where FIDO is in use, these additional aids are needed to assure pilots of their position and of a proper approach to the field. As tested at the experiment station, these aids included:

(1) High intensity approach lights extending into the approach zone of principal runways to give the pilot visual assurance of his position and altitude.

(2) High intensity runway lights to outline the runway as the landing is made and to guide the pilot in taxiing quickly off the landing area.

(3) An Instrument Landing System (ILS) projecting at least 15 miles into the approach area a sloping radio beam down which the airplane can approach accurately. This system permits either manual or automatic flight control.

(4) Ground radar which permits monitoring of all planes in flight within a given area. The ground control approach (GCA) developed for military use includes the equipment for this service and can also be used to direct planes to actual landings in an emergency.

The ground equipment of ILS consists of two radio beam transmitters known as the Localizer and the Glidepath, and three marker beacon transmitters. Carrier waves from the transmitters oscillate needles on the plane's panel board, one vertically, the other horizontally. When they are at right angles, the plane is following the proper path. The marker beacon transmitters are located at known distances from the landing point, and their signals inform the pilot of his distance from the field.

The GCA unit uses radar equipment located on the ground by which the GCA controller locates all planes within a distance of 30 miles and personally directs the approaching pilot with regard to his air course, air speed, rate of descent and corrections required to bring him to the runway in suitable position for landing. It requires no additional equipment on the aircraft.

Although electronic aids will bring a plane safely to the runway at an elevation as low as 50 feet, visual references should be available to the pilot at considerable distance out in the approach zone. To serve this purpose a high intensity, funnel-shaped approach lighting system was designed with lights 700 feet apart at the approach end and converging gradually toward the center way. This pattern channels the landing plane toward the runway and directs the pilot to straighten out for a landing at a safe altitude before coming over the runway.

Electronic navigation aids guide planes into the approach light funnel. Approach lights direct the pilot visually toward the runway threshold. Beyond this point additional markers along the runway are required to establish the ground plane upon which the pilot must land his aircraft. The problems of runway marking are virtually the same as those of approach lighting—high candlepower for fog penetration and sufficient angular distribution to assure visibility.

The conclusion drawn from the tests conducted at Arcata is that no one of the various landing aids investigated is sufficient by itself to provide the safety and reliability essential to a fully dependable air transportation system. Each fulfills certain requirements and each must be used in proper correlation with the others if airlines are to operate independently of weather conditions.

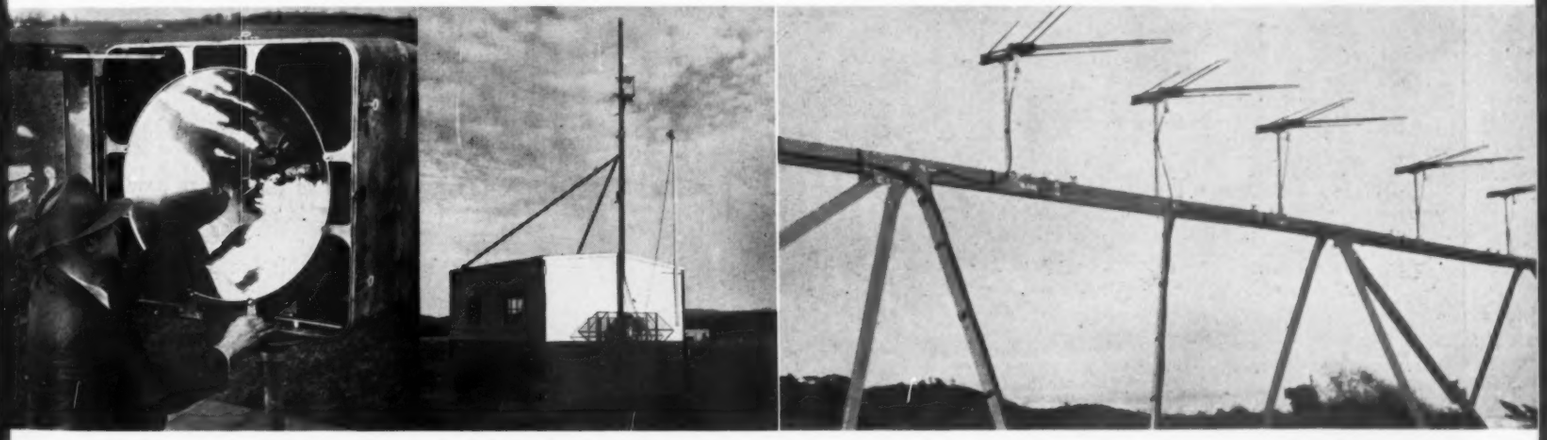
Components of integrated landing aids as proposed by the research staff of the Landing Aids Experiment Station comprise the following basic units:

(1) Electronic low approach aids which will assure that the plane is brought precisely and safely down the approach zone to the runway at an altitude, heading and speed suitable for final approach to and landing on the runway;

(2) A suitable method of marking the final approach and runway areas so that the pilot will be certain of his location and have adequate visual reference points for completing a contact landing;

(3) A fog dispersal system for extreme poor visibility conditions, which will insure that the final approach and runway areas are visible to the pilot as he terminates his approach and sets his plane on the ground.

One point emphasized by the experts who directed tests at the Landing Aids Experiment Station is that in order to operate successfully in bad weather the identical flight procedures and ground control methods must be adhered to in good weather. Admitting that there will be a tendency to relax the observance of precision and details under good weather conditions, they point out that such laxity will increase the strain on the human elements under less favorable conditions. Any procedure adopted must be routine. Installation of the equipment required has been estimated to cost possibly half a million dollars, this to include electronic aids, high intensity approach lights, high intensity runway markers and a high pressure FIDO system. Compared to the value of the planes which it is designed to guard, the cost is very moderate, and it represents not more than one or two percent of the total cost of the airport as a whole. Operating and maintenance costs are moderate and consist mainly of payments for the services of the added personnel employed.



Left: Westinghouse 3,300,000,000 candlepower light; Center: Landing Aids glide path transmitter station; Right: LAES transmitter for sending longitudinal beam down center line of runway and approach for blind landing.

Acknowledgment for information contained in the foregoing article is made to papers presented by Robert L. Champion, Landing Aids Experiment Station, Arcata, California, and by Ray D. Kelly, Superintendent of Engineering Development, United Air Lines, before the National Aeronautic Meeting of the Society of Automotive Engineers, New York, April, 1947.

BOLIVIA UNDERTAKING BROAD EXPANSION OF PETROLEUM INDUSTRY

IN Bolivia the past year has been one of preparation for carrying out a program of oil industry development which has been under consideration since the close of the recent world war. The change in government which took place in July, 1946, temporarily delayed progress in carrying out the plans that had been drawn up, but since that time activity has been resumed and certain changes have been incorporated with the prospect that before the end of the current year a new era of expansion in the nation's oil activities will be actively under way.

Principal features of the contemplated program are the following:

(1) Adoption of a new petroleum law which would permit the organization of mixed companies in which foreign capital would participate with the YPFB, the government-owned corporation, in development of the country's oil reserves.

(2) Drilling of a substantial number of wells to increase the output of existing fields.

(3) Exploration of undeveloped areas in the effort to find new fields.

(4) Building of pipe lines from fields to distribution centers.

(5) Erection of two refineries to provide products for the domestic market.

Certain phases of this broad undertaking are already in process of execution. A contract for the pipe line was let in September of last year. Agreements for the drilling of development wells were likewise made but are subject to ratification by the Bolivian Congress which also is expected to decide upon a revision of the petroleum law at its present session.

Draft of a proposed law which would permit the establishment of mixed companies in which foreign capital could participate was prepared early last year for submission to Congress at the session scheduled to meet in August, 1946, but the revolution which took place in July and the consequent postponement of the meeting prevented its consideration. However, the provisions of the bill were such that it was doubtful whether

Above: Modern airport at Santa Cruz.

Center: Williams Brothers Company pipeline construction camp at Tin Tin, Bolivia.

Below: Even crawler tractors have a tough time traversing some of the right of way of the new Bolivian pipe line being built by Williams Brothers Company.

North American investors would be willing to risk their capital under it, and revision of some of its clauses was recommended.

That such capital can be interested under satisfactory conditions was indicated by the contract made by YPFB with the Superior Oil Company in October, 1946, granting the latter exploratory rights for seven years on 4,000,000 hectares of land in the Bolivian Chaco and development rights on nine percent of this area for a period of fifty-five years. The operating company was to be exempted from the payment of bonuses, rents or surface taxes, but was subject to royalties on oil produced, varying from 13 per cent to 40 percent, depending upon the depth and productivity of wells. As previously stated, the contract was made subject to approval by the Congress.

Up to the present Bolivia's oil production has been small and has come from a limited number of wells in three fields—Camiri, Sanandita and Bermejo. The wells range in depth from 2,000 to 3,500 feet. Camiri produces a very light crude of 60 API and up. That of Sanandita is 35 API and at Bermejo, 34 API. Because of its location close to the Argentine border, Bermejo crude is shipped into Argentina for refining. During 1946 two new wells were started at Camiri, while others were deepened; one was drilled at Sanandita and three others at other locations. Since the program of the YPFB calls for a large increase in production, a much more active drilling campaign is needed. As a move in this direction and to exploit reserves of the Camiri field, estimated at 18,000,000 to 20,000,000 barrels, a contract was made with the South American Oil Development Company of Texas to drill 50 wells in that district. Of these 22 are to be put down this year. Provision is made in the contract for some of the wells to be drilled in the nearby Guarui or Mandeyapecua areas if the test drilling now under way in those fields produces a type of crude heavier than that found at Camiri.

In February of last year an agreement was made with Williams Bros. Corporation of Oklahoma for the building of a pipe line from Camiri to Tin Tin, a distance of 255 miles, the line to be of six-inch diameter and the system to include three pumping stations, a 20,000-barrel storage tank, a 10-car loading platform and a single circuit telephone line from field to terminal. Later it was decided to extend the line to Cochabamba, and in deference to demands of the Department of Chuquisaca, to build a four-inch extension from Zudanez to Sucre where an additional refining plant is to be erected. Surveys of the pipe line route have been run and construction is waiting only upon arrival of pipe and equipment for the pumping stations. While questions have been raised in financial circles as to the ability to fill the pipe line, officials of YPFB are confident that the daily output at Camiri will be above 1,100 barrels which they regard as sufficient for economical operation of the line.

Not much progress has been made on the pipe line thus far. Adverse weather conditions and lack of materials have delayed operations. The rainy season this past winter has been the most severe in many years and has made mountain roads impassable for trucks carrying heavy materials. After two vehicles were lost by caving roads, the effort to carry on was abandoned.

Concrete footings for diesel engines and pumps have been poured at pump station sites, but machinery has not been installed as yet. Williams Brothers officials estimate that the stations will be ready well in advance of completion of the pipe line itself.

Some pipe for the line is being shipped from Panama where it was used in war emergency operations. Shipments from United States pipe mills are beginning, so that actual laying of the line can get under way this spring. A major part will be laid before the next rainy season.

The line is to be laid on the surface except at river crossings. Terrain over much of the route followed by the line is too rough and rocky to permit ditching. Pipe will be cold painted to avoid corrosion.

Survey work was difficult in the mountains where the line cannot follow an established road. Indian guides were used to seek shortest practicable routes, but even with the help of the mountain people, many routes had to be abandoned after promising starts. Even now the contractors are not sure that the line will follow the present survey throughout its entire length.

Decision to erect the principal refinery at Cochabamba instead of at Santa Cruz as originally proposed was made because Cochabamba is a convenient distributing center for the Altiplano region whence comes the largest demand for petroleum products. Being more isolated, Santa Cruz would present a more serious transportation problem for the movement of products to this area. Moreover, it was argued, oil reserves exist in the Santa Cruz area which are expected to be tapped in the future, in which event it would be uneconomical to transport unneeded oil from Camiri to that point.

To process the crude that will be delivered by the pipe line, a modern combination unit of 3,000 barrels daily capacity will be constructed at Cochabamba, and a 2,000-barrel topping plant will be built at Sucre to supply the needs of the district.

To carry out the development program set up by YPFB, the estimated cost will be $17,500,000. Funds available for this purpose include $5,000,000 promised by the Banco Central of Bolivia and a loan of $5,500,000 approved last year by the Export-Import Bank at Washington. Negotiations have been under way recently looking to an increase of this loan in view of the broadening of the original plans. YPFB officials estimate that when the program is in operation it will have profits of $4,250,000 annually and will be able to save the country $2,000,000 each year in foreign exchange now expended for petroleum products.

These projected developments are independent of the agreement previously concluded by the Comision Mixta Boliviano-Brasilera de Estudios de Petroleo for development in the Santa Cruz area and the district east of the city through which the Corumba-Santa Cruz railway is to pass, connecting with a Brazilian-built line extending eastward to the Atlantic. Exploratory activities contemplated by this undertaking are being continued, but some clearer definition of the economic zones covered by the various agreements may be needed to prevent their overlapping. Under the project put forward by the Comision Mixta and ratified by treaty between Bolivia and Brazil, drilling and oil production will be handled by a company in which Bolivia will have a 51 percent and Brazil a 49 percent interest. If oil is discovered, it will be delivered to a refinery at Corumba to be erected by Brazil. Plans for a joint transportation system to move the oil are expected to be worked out. The Comision Mixta has asked for bids to cover the drilling of twelve wells, and it is hoped that drilling operations can begin later this year.

As a government agency operating under executive authority through the Direccion General de Minas de Petroleo, YPFB exercises control of oil production and refining and the sale of gasoline, kerosene and fuel oils. Under the organic act establishing the agency, it was given a monopoly on trade in petroleum products, but this was later modified and private concerns deal in oil, lubricants and greases. The marketing functions of the agency are handled by La Distribuidora de YPEB. It has been proposed to turn over retailing operations to private interests, but no action in this direction has been taken as yet.

Production of crude oil in Bolivia during 1946 amounted to 362,659 barrels as compared with 381,554 in 1945. Production by fields consisted of 128,481 from Camiri, 113,021 from Sanandita and 121,156 from Bermejo. At the end of the year six wells were drilling, two were being deepened and one was re-drilling.

To supplement domestic production, 149,928 barrels of petroleum products were imported, including 138,325 barrels of gasoline, 10,691 barrels of kerosene and 912 barrels of diesel oil.

Sentiment in Bolivia strongly favors the further development of the country's oil resources as a means of aiding industrial progress. The capital and engineering abilities of the United States will be welcomed in bringing about this result, but with careful provision for protection of the nation's interests in its petroleum resources.

Based partly on a report by S. M. King, American Embassy, La Paz, Bolivia, and made available to WORLD PETROLEUM through the courtesy of the Fuels and Lubricants Section, Office of International Trade.

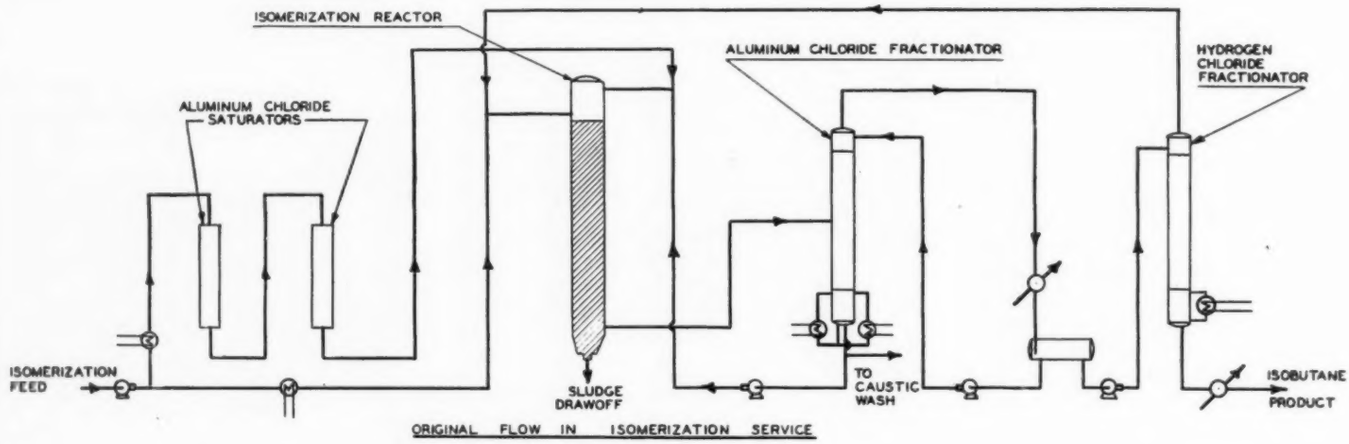
CONVERTED ISOMERIZATION UNIT NOW MAKES POLYMER GASOLINE

By LOUIS C. BROWN

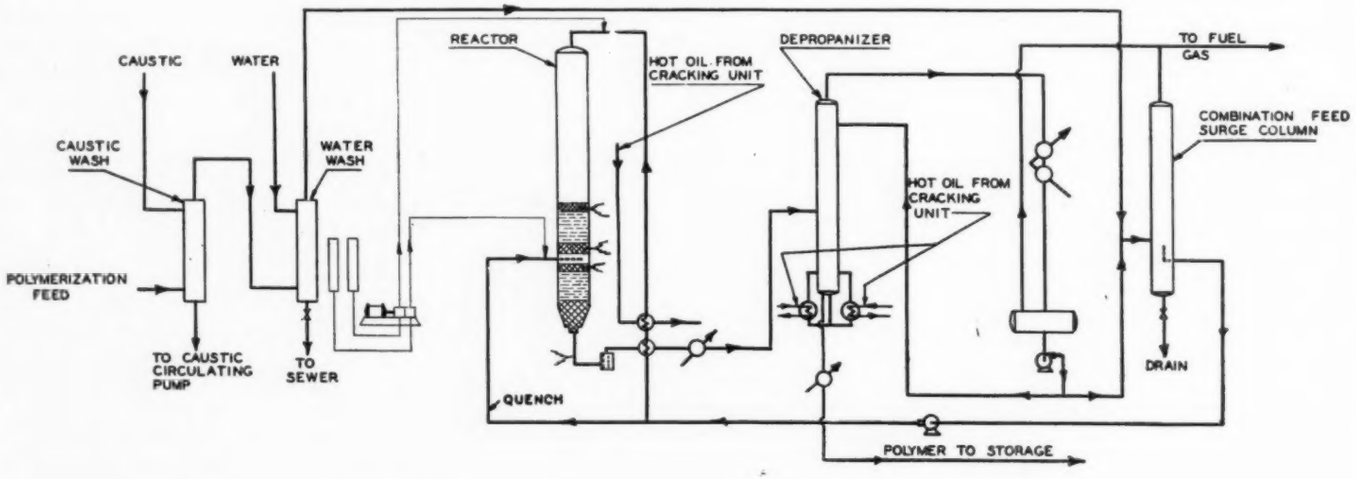
Cooperative Refinery Association
Chief Refinery Engineer

CONVERSION OF ISOMERIZATION UNIT TO POLYMERIZATION UNIT

COOPERATIVE REFINERY ASSOCIATION
COFFEYVILLE, KANSAS



ORIGINAL FLOW IN ISOMERIZATION SERVICE



PRESENT FLOW IN POLYMERIZATION SERVICE

IN the plant of the Cooperative Refinery Association at Coffeyville, Kansas, a former butane isomeration unit which had played an important part in the production of 100-octane gasoline during the war years, is now operating in the peacetime role of producing high-grade motor gasoline. Converted to a U.O.P. polymerization unit nearly a year ago, it has been averaging a daily make of 150 barrels of 10-pound RVP polymer gasoline. This represents a conversion to gasoline of 300,000 cubic feet of cracked gases formerly burned as refinery fuel.

The butane isomerization unit, an element of the government-owned 100-octane facilities which were operated as an integral part of the refinery during the war, was readily adapted to its new service by a few simple changes. The cost of the job was about $18,000, and the work was done by the refinery maintenance department in three weeks. Construction cost of a new polymerization unit to produce the same results would approach $100,000 under today's conditions, but it is doubtful that construction could be completed under six months due to material shortages. The cost of the conversion has been paid out in a very short period of operation.

The polymer gasoline has an ASTM clear octane rating of 82.0 and a research clear octane rating of 95. Its ASTM blending octane value has been determined at 89 in thermally cracked gasoline, whereas with straight run gasoline from Mid-Continent crude oil it has a blending value of 100 ASTM octane rating. Since it is possible to use all excess butane for vapor pressure requirements, the added volume of gasoline provided by the polymerization is about 3.5 percent, based on the thermal cracking charge, or 6.0 percent when gased on a 10-pound RVP cracked gasoline. The ability to produce such high octane blending stock has decreased tetraethyl lead requirements 0.22 cc/gal. on regular gasoline, and 0.3 cc/gal. on premium grade gasoline as is now produced in the Mid-Continent area. Laboratory tests have shown that a blend of 290° E. P. straight run gasoline and polymer gasoline in a volume ratio of 74 to 26 will yield a finished 10-pound RVP gasoline of 84.0 ASTM octane number (3cc TEL/gal.).

The 100-octane gasoline facilities, which were designed by engineers of Universal Oil Products Company, were under construction when the Cooperative Refinery Association took over the plant. Essentially, the facilities consist of a fluid catalytic cracking unit with a design capacity of 3,900 barrels per day, an HF alkylation unit with a production capacity of 1,500 barrels per day, the isomerization unit rated at 300 barrels per day, together with a complete gas concentration unit, utilities, blending facilities and tankage.

The high octane plant was put in operation in May, 1944, when all efforts were directed toward the maximum production of aviation gasoline for the armed forces. To augment the feed stock for the alkylation unit, a thermal naphtha reforming furnace, capacity 1500 barrels per day, was erected and operated as a part of the thermal cracking unit.

After V-J Day, the government-owned facilities were shut down, inspected and placed in standby condition. At that time the Cooperative Refinery Association management elected not to negotiate for the purchase or lease of the catalytic cracker or any part of the high octane facilities but to rely on the thermal cracking unit as the heart of the light oil operation until a more stable picture of future gasoline market requirements, presented itself.

The thermal cracking unit is flexible and efficient, usually requiring but three cleanouts per year. The charging stock ranges from reduced crude of 25° API gravity to a mixture of gas oil-reduced crude of 31° API. At present the unit is running about 3,900 barrels per day of 30° API charge stock. For a period of two months during the past year an excess of gas oil charging stock was cracked by single-pass through the reforming furnace, at which time total cracking charge to the unit was 5,700 barrels per day. More recently the demand for lube oils has decreased the amount of reduced crude available for the thermal cracking unit, resulting in a low volume charge.

Louis C. Brown

During the fall and winter of 1945-46, study of the thermal cracking operation indicated that the amount of butane-butylene lost to fuel gas, even though stabilizing to winter specifications on vapor pressure, was by no means a negligible factor. Looking ahead to summer vapor pressure requirements and as a consequence increased gallonage of gasoline lost as fuel gas, the refinery management decided to utilize the gas for production of additional gasoline. Having had considerable experience with the U.O.P. polymerization unit and its low-cost operation, the refinery's engineering department made a complete analysis of the isomerization unit and laid out the revamp details. U.O.P. engineers were requested to study the proposed changes and make further recommendations.

The results of this survey showed that the isomerization unit could be readily converted to a polymerization unit at a small cost. Negotiations between Cooperative Refinery Association and the Reconstruction Finance Corporation were begun and resulted in the leasing of the unit. More recently the Cooperative Refinery Association purchased the government-owned high octane facilities for $1,200,000.

Because of the isolated location of the isomerization unit and the inadequate steam supply, it was decided to use hot oil from the thermal cracking unit for preheating the combined poly feed and for supplying heat to the depropanizer reboiler. Erection of nearly 1500 feet of four-inch insulated oil line from the thermal cracker and return constituted the main item of expense in making the conversion.

The feed is obtained as liquid from the cracked gasoline stabilizer which normally produces a four to five pound RVP gasoline. The absorber and stabilizer are doing an excellent job of recovering approximately 95 percent of the butane-butylene fraction and up to 30 percent of the propane-propylene fraction. The liquid condensate is charged to the feed pretreating system at the poly unit by pump which is controlled by level in stabilizer overhead receiver. Liquid volume is measured as it enters poly plant by flow recorder.

The aluminum chloride saturators, which have been filled with Raschig rings to insure good contact, are used as caustic wash and water wash columns for pretreatment of feed. The former hydrogen chloride recovery column is utilized as a surge column to handle combined recycle and fresh feed. The suction riser has been extended above the combined feed inlet to permit a small interval of settling time for any water that may have been carried out of the fresh feed water wash column. This column also provides for short shut-down periods without cutting down poly feed production at the thermal cracking unit stabilizer, as well as retaining low olefin content recycle during the thermal cracker shut-down, thus eliminating possible damage to catalyst by starting up on fresh feed.

The isomerization reactor was found to be good for the temperature and pressure conditions required to promote the polymerization reaction, and hence it was adapted to a poly reactor. Two catalyst beds were installed in the column and filled with solid phosphoric acid catalyst over a supporting bed of crushed fire brick. The upper two-thirds of the column is vapor space. The combined feed is brought into the reactor and by means of an internal vertical line is discharged above the first bed. In the space between the two beds is a distribution ring for quench inlet

TABLE I

Yields from Cracking and Polymerization

Charge	BPD	Vol. %
Reduced crude-gas oil mix	3900	100.0
Yield		
Residuum	1053	27.0
Stab. Gasoline—5.5# RVP	2176	55.8
Butanes	156	4.0
Poly gasoline—2# RVP	137	3.5
Gas and loss	378	9.7
Fuel gas	1.9×10^6 SCF	
API°	61	
RVP	10	
ASTM clear	72.3	
† 3 cc's	79.9	

and to promote rapid mixing of the quench with first bed effluent.

The former isomerization charge pump was found to be too small for combined feed, and permission to use the alkylation motor-driven gland seal pump was given by government representatives at Coffeyville. It was a relatively simple job to adapt it to pumping the light material. Four G-fin sections are used to exchange heat between combined feed and reactor effluent. Final preheat of the feed is obtained in four G-fin sections by use of the hot oil from the thermal cracker. A temperature controller regulates the oil flow to the preheater. A part of the combined feed bypasses the preheaters to serve as quench between the two catalyst beds for control of the temperature increase due to the exothermic reaction.

The aluminum chloride column is now in service as the polymer gasoline stabilizer. The condensers, receivers and reflux pump were adapted to the new service without change. Since this system has a spare reflux pump, however, it was decided so to manifold the two with the charge pump that one could spare either of the two duties.

Flow through the unit is as follows: Fresh feed enters the unit through the feed pretreatment section and into the combined feed surge drum. Recycle is added to the fresh fuel line upstream to the surge drum inlet, to provide proper mixing. With the flow of both streams being recorded, it is comparatively simple to control the recycle to fresh feed ratio to produce a combined feed of 18-19 percent olefin content. Pretreatment of the feed consists of a counter-current caustic wash and a counter-current water wash. A duplex pump is used to circulate caustic, and a plunger type pump continuously adds fresh caustic.

The results from feed pretreating are very good. Tutweiler analyses on the fresh feed have ranged from 100 to 125 grains of hydrogen sulfide and mercaptans per 100 cubic feet. After scrubbing, the feed contains 10-15 grains. Mercaptan content of the finished poly gasoline is 0.0009 percent. With this low figure, the poly gasoline is blended back with stabilized gasoline after the latter has been through the doctor-treating unit.

The pumps that supply water for hydration of the catalyst are connected to the same drive shaft as the caustic make-up pump. Water is added to the combined feed after it leaves the preheaters for the first bed of catalyst. Hydration of second bed is performed by introduction of water between the two beds along with the quench.

From the surge drums the feed is charged through the preheaters to the reactor. The effluent from the reactor bottoms passes through a filter pot to remove any entrained catalyst fines. Leaving the filter pot, the effluent exchanges heat with the combined feed, passes through two sections of the water-cooled G-fins, then enters the depropanizer column.

The overhead from the column is cooled sufficiently to condense liquid reflux and recycle, the excess gas being released through a pressure control valve into the fuel gas system. Both the vertical reboilers are in use on the depropanizer using the thermal cracking hot oil as a heating medium. Poly gasoline of 35-40 pound RVP is drawn from the bottom of the depropanizer column by level control. It is cooled in four sections of water-cooled G-fins before being sent to storage with the cracked gasoline. Yields and character of products are shown in Table I.

The unit was placed in operation on April 28, 1946. After two days of circulation and checking of equipment, flow was cut through the reactor and the first poly gasoline was produced.

Podbielniak analysis of the feed and products of the polymerization unit are shown in Table II.

At the present writing, the unit has produced 117 gallons of poly gasoline per pound of catalyst, and it appears that catalyst life will approach 150 gallons.

The long catalyst life during the present run may be attributed to a proper recognition of the many reactant variables by the operating personnel and unusually complete instrumentation. The olefin content of the combined feed, governed by the recycle, seldom varies from 18-19 percent. The space velocity, important in promoting sufficient reaction time for optimum conversion with a minimum exposure of polymer gasoline to the catalyst, has been maintained by keeping the combined feed charge substantially constant. Reactor temperatures were kept to a minimum. The fresh feed is constantly checked for pentane fraction and caustic or water carry-over. It is also felt that the care used in charging catalyst to the tower has materially aided in keeping down pressure drop.

TABLE II

Typical Analysis of Polymerization Streams

	Fresh Feed Moly. %	Fuel Gas Mol. %	Finished Poly Gasoline Liq. %
H_2	Trace	Trace	
C_1	0.9	9.7	
$=C_2$	1.4	7.9	
C_2	8.1	30.3	
$=C_3$	16.5	4.1	0.3
C_3	22.9	46.5	1.2
$=C_4$	28.1	0.5	7.5
C_4	21.0	1.0	44.0
C_5—115°	1.0		2.7
115°—E.P.			44.3
Sp. gravity— 115°—E.P.			0.735

Coal Gasification Discussed

A preview of the coal industry's possible invasion of future oil markets was given the Executives Club of Chicago last month by George H. Love, president of Pittsburgh Consolidation Coal Co.

It is this company which is building a coal gasification pilot plant in cooperation with Standard Oil Co. (N.J.) and is joining with railroads and other coal companies in the development of a gas turbine locomotive to compete with the diesel.

In his address Mr. Love said, in part: "The actual time when construction of a commercial size plant will be started in Western Pennsylvania depends on the economics involved, but the trend toward higher development and recovery costs of natural gas and petroleum and the possibility of finding better methods by pilot plant operation lead us to believe that the time when we will start engineering such a plant will not be long delayed. Such a plant near Pittsburgh might cost as much as $120,000,000 but it could produce gas in quantity equal to the carrying capacity of both the Big and Little Inch pipe lines. The size refinery or plant we are considering will use 20,000 tons of coal a day. This would mean work for almost 6,000 people and support to a community of 30,000 people.

"Inasmuch as the process calls for complete gasification of the coal before that gas is turned into gasoline, or into high-heat value commercial gas, the relative output may be changed from more gasoline and less gas to less gasoline and more gas. Thus, it will be seen what a tremendous advantage can be had in taking care of the winter peak load for gas and the summer peak load for gasoline with this flexible fuel.

"Allow me to illustrate this point still another way. In the light of present estimates, capacity of a plant costing $120,000,000 would be 400,000,000 cubic feet of gas per day during the months of severe weather and 14,000 barrels per day of high-octane gasoline with a lesser amount of gas fuel during the mild weather months."

Mr. Love admitted that, for the short term, oil and natural gas will encroach on coal markets. In the long run, however, he thinks that the coal-fired gas turbine will beat the diesel for railroad locomotives and that the inevitable increase in the cost of finding and developing oil and gas will work in coal's favor.

Colonel Ernest O. Thompson

COLONEL THOMPSON.... PROPHET OF CONSERVATION

COL. Ernest O. Thompson, chairman of the Texas Railroad Commission and one of the nation's leading supporters of oil and gas conservation, recently wrote an address titled "Octane Versus Conservation," for presentation at the annual meeting of the Natural Gasoline Association of America. To his five-and-a-half-page manuscript he added an appendix of more than eight pages in which he sought to prove his point by quoting 20 technical papers published in the trade press or presented before such groups as the Society of Automotive Engineers. After presenting his paper at Dallas, the Colonel took a plane to Birmingham and repeated the story to the Interstate Compact Commission. Then he hurried up to Chicago and talked to the American Gas Association.

The Colonel is like that. He believes in conservation, and he has put a very great share of his energies into its promotion since he first took his place on the Railroad Commission when Pat Neff retired fifteen years ago. Except for the period during the recent war when he was borrowed by the federal government to aid in supplying military petroleum needs, Colonel Thompson has been doing his level best to persuade or force the industry to improve its practices. He had not been on the commission long before he took the spectacular course of ordering the entire East Texas field shut down because of the low price for oil and the highly competitive practices then current in that roaring field. He's still at it. Lately, for example, he felt that operators in the Seeligson field were not making all possible speed in reducing the amount of gas flared, so he ordered that field shut down until compressors could be installed to reinject the gas into producing horizons. The courts stayed that order as they have others, but the Colonel isn't discouraged. He believes that progress is often achieved by attempting to do something that can't be gotten away with.

His job isn't just a means of making a living to Colonel Thompson. They don't pay railroad commissioners big salaries in Texas, and the Colonel has been offered a number of legal berths with salaries several times as large as that paid by the State of Texas. He has always declined. In the first place, the Colonel doesn't have expensive tastes or habits, and in the second place, he made a good stake in the oil boom days of Amarillo 20 years ago. He owns or has a substantial interest in hotels at Clarendon, Panhandle and Amarillo, Texas, and one of the principal office buildings in Amarillo.

The Colonel got his education the hard way. While he was studying law in the University of Texas, he served as a law clerk to Justice Gaines of the Texas Supreme Court. World War I came on when he was a youngster just trying to get started. He made a spectacular record in the war, ending up at the age of 25 as a full Colonel in a machine gun regiment. It is said that he was the youngest Colonel in the Army in that war.

As an attorney in Amarillo after the war, Colonel Thompson was a town booster. He believed in the town and put his money into real estate and building. The big Herring hotel at Amarillo and the depression almost broke him, as it did a lot of hotel men, but he managed to weather the storm without losing his holdings. Along with his legal and real estate operations, the Colonel was drafted as mayor of Amarillo. In that job he put on a whirlwind campaign for lower telephone, light and gas rates.

In his recent talk before the American Gas Association, Colonel Thompson tells of some of his early promotion work in the Panhandle. "I well remember back in 1919 at Amarillo," he said, "when our people got together 60,000 acres of oil and gas leases to induce someone to bore for oil. Hapgood No. 1 came in as a gasser and everyone was disgusted and disappointed. We were looking for oil. Finally it was proposed that this natural gas be brought to town for light and fuel and there was the biggest fight you ever saw over the idea of such a thing. Our artificial gas plant people said this natural gas would blow everything up and besides it would be injurious to the health of the people of Amarillo.

"Finally we got our Chamber of Commerce busy looking for industries to come and fill our prairies with smokestacks, using our gas for fuel. We spent $60,000 advertising this abundance of gas in the world's largest field. We even offered free gas for five years to any industry who could come to Amarillo and employ fifty or more people.—None even came for free."

The quotation is revealing. It shows how the young lawyer just back from the war refused to bow under the disappointment of his early promotional enterprise; how, instead, he started a scrap to make use of what had been found.

Colonel Thompson is not a dreamer with his head in the clouds paying no attention to dollars and cents. At the Dallas natural gasoline convention he interrupted his prepared address to ask how much residue gas is worth today in California. When told that it ranges upwards from 11 cents per thousand, he said that with such a price for gas in Texas, he would not need to preach conservation. "It is all a matter of economics," he said. "When the product will bring enough money to make it worth while, residue gas will be recompressed and piped to market." In the meanwhile the Colonel is trying in every possible way to prevent flaring.

Based on the present price of fuel oil at the refinery, the Colonel maintains that natural gas is worth 30 cents per thousand at the well. He is happy that Texas gas no longer is selling even for carbon black at 1.5 cents per thousand. The present market for three to five cents is a lot better, but he is pushing for more and more money for the producers so that wastage will be reduced.

U. S. Bureau of Mines reports indicate gas loss and wastage in Texas at 643,751 million cubic feet in 1944. In 1945 this was cut down to 553,700 million cubic feet, a drop of nearly 14 percent in a single year. In his Chicago address Colonel Thompson said that when presently building and planned gasoline plants are operating, the casinghead gas flared in Texas will be only 18.4 percent of the total. Flare gas will be reduced another 24.9 percent and flaring will be restricted to isolated fields.

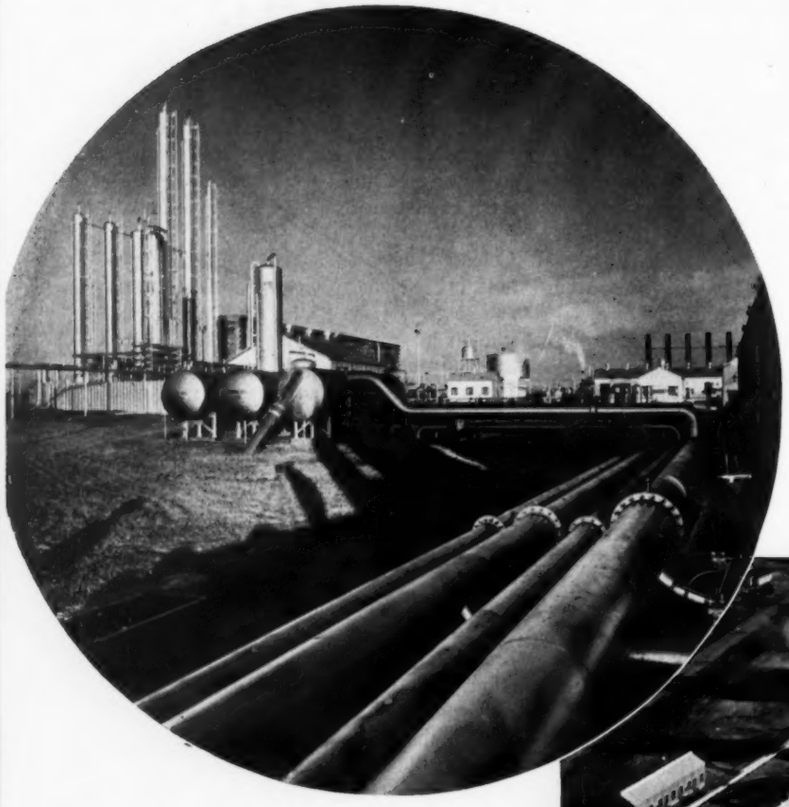
Warning was served on the American Gas Association that the Texas Railroad Commission expects to allocate casinghead gas to the pipeline companies first. Only after this gas is taken will the Commission permit dry gas to be produced.

As long as he heads the Texas Railroad Commission, Colonel Thompson wields a big stick over a major portion of the petroleum reserves of the United States. Based on most recent calculations of the American Petroleum Institute, Texas has 55.79 percent of the nation's crude reserves, 60.43 percent of the distillate reserves and 87.46 percent of the reserves of light hydrocarbons such as natural gas and natural gasoline.

(Continued on page 76)

GASOLINE PLANT BUILDING ACTIVE

Large Increases in Exports and Improvements in Domestic Markets Stimulate Search for Gas Supplies and Construction of New Plants



Below: Monument New Mexico, plant of Warren Petroleum Corp. which is being enlarged to provide residue for the new Texas-California gas line. Robert Yarnall Richie photograph.

THE natural gasoline industry in the United States appears to be entering a period of prosperity which many think will continue for several years to come. Currently the optimism in this branch of the industry is responsible for an active construction program and a diligent search for gas supplies suitable for plant construction. Plants are being planned for erection on properties which formerly were considered uneconomic for one reason or another. Now the natural gasoline market outlook is such that payouts are far more attractive than before the war.

In past years the market price for natural gasoline at this season usually has been far below that enjoyed by manufacturers in the fall and winter months. Annual price averages have followed motor fuel markets rather closely in the past fifteen years, the differential between the two being 1.5 to 2 cents per gallon in favor of finished motor fuel. But within most years there have been wild fluctuations in price. During the war seasonal fluctuations were unimportant, but usually the low spring price for naturals is only about half the winter peak when refiners are seeking high volatility for winter starting.

Possibly 1946 may be considered a typical year for natural gasoline. The January high was 4.5 cents per gallon. In the late spring the price dropped 40 percent to 2.75 cents, and then climbed back to five cents by the end of the year. The June price thus was 55 percent of the December price. The industry has sought to minimize these violent fluctuations through storage but has been only partly successful.

This year the winter market for 26-70 natural was five cents per gallon in Group 3, and there has been no tendency to sag. Only price changes have been upward. Except for the war years and in the 1937 bulge, this sort of market has not prevailed since 1930.

Export demand has been a factor in the improved natural gasoline market situation. Before the war a large volume of natural gasoline was shipped abroad, but most of this business was cut off by the maladjustment created by the hostilities. From a total of 257 million gallons in 1938, exports of natural gasoline dropped to 173 million gallons in 1939 and 72 million gallons in 1940. The war thus robbed gasoline manufacturers of 65 percent of their foreign business.

Now that the war is over, the foreign demand is building up again. In 1945 exports and losses totaled 57 million gallons, and last year this had increased 175 percent to 154 million gallons. Since the first of the year this trend has continued. March cargo liftings from U. S. ports and rail shipments to Canada totaled 22 million gallons, nearly 40 percent as much as in all of 1945.

In March the United Kingdom alone took 14 million gallons of natural, Canada 5.5 million gallons, Sweden 1.5 million gallons and France 600,000 gallons. Export demand has been built

back up to about five percent of current production compared with about 10 percent in 1938.

The current world-wide shortage of refinery capacity is another important element in the improved natural gasoline market. Most economists suggest that the industry will do well if it supplies the total world demand for gasoline this summer and for fuel oil next winter. Recent strikes and the Texas City disaster, which have reduced U. S. refinery runs nearly 10 percent, have not helped the supply picture. As this is written, other refiners are under strike notices so that production may be curtailed even further.

With motor fuel supplies possibly inadequate, refiners are buying both natural gasoline and even some normal butane for blending summer grades. Some wartime isomerizers are operating and there is a good demand for isobutane for alkylation. Heavy naphthas are being blended up to motor fuel volatility by the addition of naturals.

In the present emergency some refiners who have worried about vapor-locking tendencies of their fuels may be inclined to listen somewhat more attentively to the sales talk of the natural gasoline manufacturer. It isn't all sales talk either. As a matter of fact, the story is well documented with careful research.

During the past winter the Natural Gasoline Association of America conducted a series of road tests with 16 cars of 1942-1946 models in which highly volatile fuels were used, some running up to 20 pounds Reid. As a result of these tests, the association suggests that the vapor pressure of winter fuels may safely be increased from 13 to 15 pounds. It is estimated that a two-pound increase in vapor pressure during the three coldest winter months in the northern part of the United States would permit the inclusion of five million barrels of normal butane in motor fuel.

In a paper titled "Natural Gasoline Looks Ahead" delivered at the recent annual meeting of the gasoline association, G. G. Oberfell and R. C. Alden of Phillips Petroleum Co. reached the conclusion from a study of past history that "high volatility is the prime determinant of the relative value of natural gasoline." They pointed out that refinery gasolines have been becoming more volatile during the past 15 years because of increased thermal cracking, but that the "best news in many years for the natural gasoline industry (is) that catalytic oil cracking may reverse the trend by making refinery produced gasolines less volatile."

Not all of the anticipated developments in the industry favor natural gasoline, according to Oberfell and Alden. Catalytic cracking and aviation gasoline demand will tend to reduce automobile fuel volatility, while higher octane number requirements will necessitate more severe thermal cracking and reforming of heavy naphthas. On the whole the authors conclude that there will be a considerable lack of uniformity in volatility and that motor vehicle builders should change the design of their cars accordingly. With motor fuels and possible components scarce, the manufacturer of natural gasoline does not need to do much worrying about the immediate future, but some of his past experience has been such that he is inclined to be rather concerned about the long pull.

The natural gasoline manufacturer now has a second string to his bow which enables him to view the future with fewer qualms. Liquefied petroleum gases have improved in demand and selling price to the point that they constitute a substantial portion of plant income. Iso-butane does not command the premium which it brought during the war, and not all builders of new plants are putting in splitters now, but the level of prices for C_3 and normal C_4 has risen substantially, and the volume of LPG flared for want of market has dropped despite large increases in production.

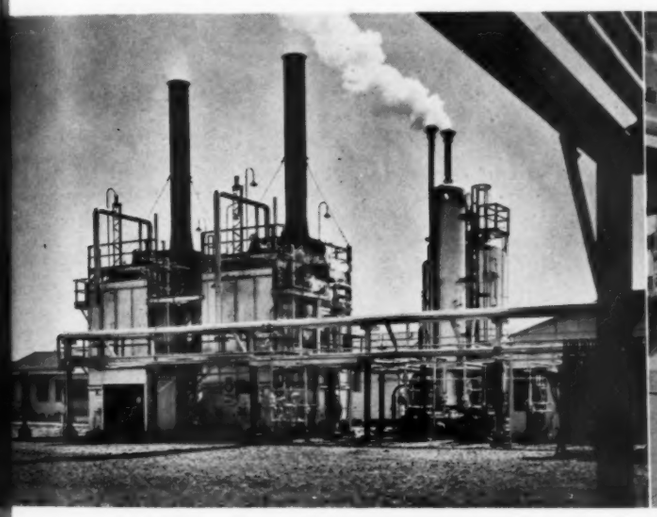
In recent years sales of LPG have risen at the rate of about 12 percent per year. In 1946 sales approximated 1.5 billion gallons compared with about 1.2 billions the previous year and only 300 million gallons in 1940. At the moment transportation facilities are hindering expansion of sales. Manufacturers could sell far more product if enough tank cars could be obtained.

Part of the building in the natural gasoline industry in the next few years will be the installation of LPG equipment in existing plants and the improvement of plants which now are selling these gases. During the war most manufacturers increased their yield of C_4 fractions to something like the economic limit, but propane efficiencies were not built up because of lack of demand. Many plants did not attempt to recover more than 20 to 40 percent of the available propane. Now that propane is bringing up to four cents per gallon at Gulf Coast plants, it is economically feasible to install equipment to increase recoveries up to the neighborhood of those which have been common in butane extraction.

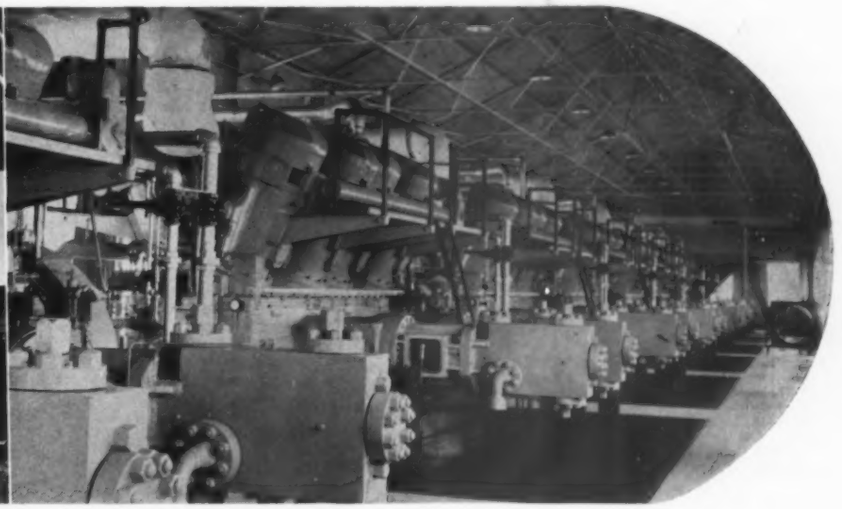
Most of the natural gasoline plant construction work now in progress or announced is centered in Texas, although the Rocky Mountain area and Oklahoma, Louisiana, Arkansas and Mississippi are well represented.

The new Texas-California gas line which will provide an outlet for 125 to 305 million cubic feet of Texas and New Mexico gas is responsible for a considerable part of the construction work. In addition to the gas to be supplied by Phillips Petroleum Co. from the Panhandle gas fields and its West Texas plants totaling some 125 to 180 million cubic feet daily, El Paso will buy from a number of new plants.

One of the large new plants built recently is Glenn McCarthy's cycling and gasoline plant at Winnie, Texas. Ellwood M. Payne, photo.



Engine room of Katy Cycling plant near Houston, Texas. This plant has just been enlarged. Humble Oil & Refining Co. photo.



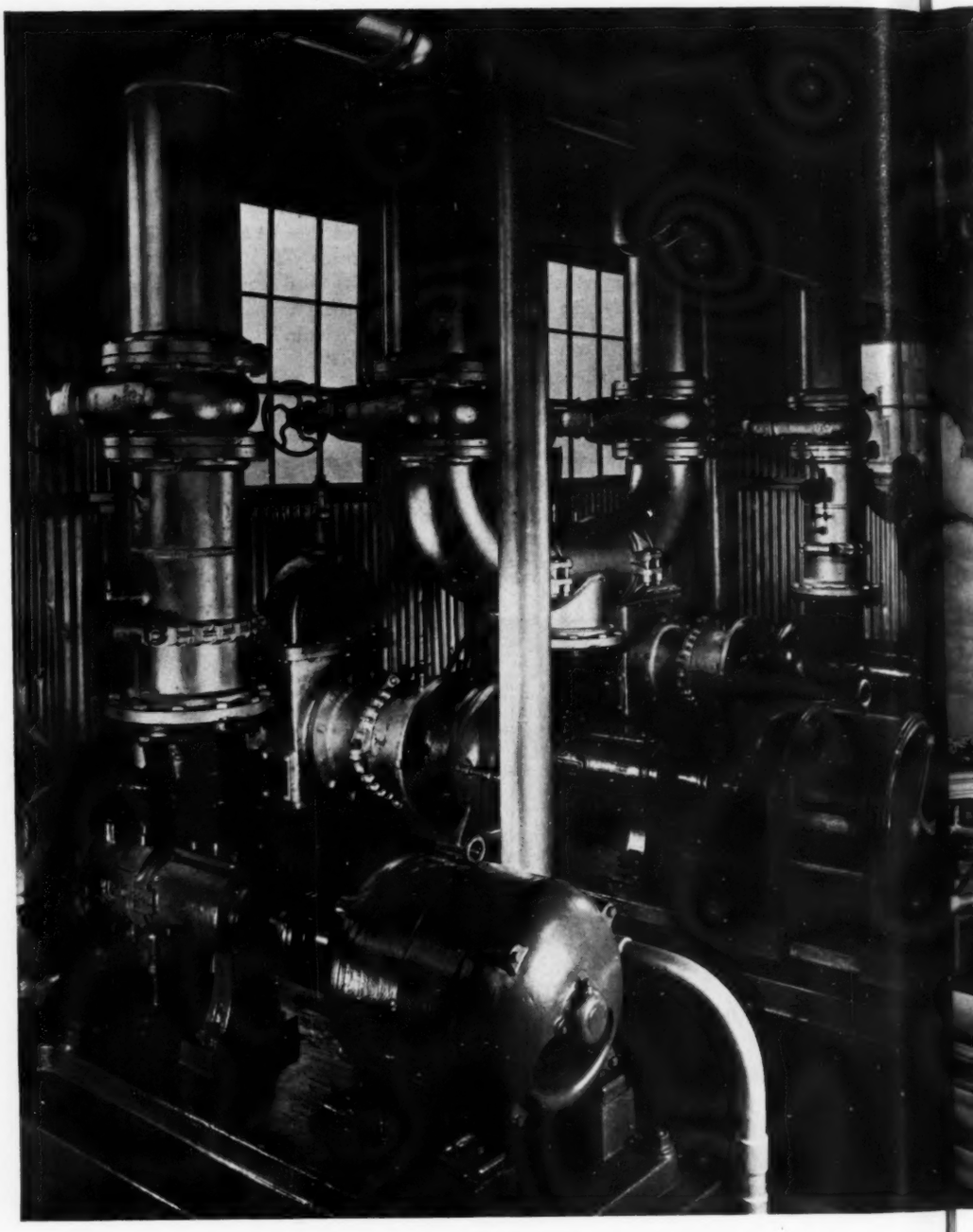
Warren Petroleum Corp. will enlarge the capacity of its Monument, New Mexico, plant from 37 to 64 million cubic feet. El Paso is to take 25 million cubic feet of residue from this plant. Shell Oil Co. will spend $3 million to build a gasoline plant in Ector County, Texas, to process 30 to 40 million cubic feet of TXL and Wheeler field gas. Residue has been sold to El Paso. This plant will produce LPG which is in very great demand in West Texas.

Gulf Oil Corp. has signed a contract to supply 30 million cubic feet of gas daily to El Paso from a plant to be erected in the Keystone field in Wheeler County, Texas. In the same field the Sid Richardson and Harry Bass interests will build a $5 million gasoline plant to process 70 million cubic feet of gas for El Paso and to repressure so that flare gas will be eliminated. The same interests also are considering erection of a $20 million Fischer-Tropsch plant to process West Texas gas for motor fuel production. This would be the third plant of this character in the United States. El Paso Natural is reported considering erection of its own plant in the Keystone field alone.

In the Texas Gulf Coast area Stanolind Oil & Gas Co. has just completed its Hastings field plant near Houston. This plant has a gas capacity of about 30 million cubic feet. It started off processing 29 million feet and producing 1200 barrels daily of gasoline and LPG. Stanolind has a number of other projects planned or under construction. In Texas these is the 90 million cubic foot Slaughter field plant. In Colorado Stanolind and the California Corp. will build a $4 million gasoline plant in the Rangely field and in the Elk Basin field in Wyoming will be operator for a unitized group building a 12 million cubic foot repressure and extraction unit.

Magnolia Petroleum Co. has announced two major projects in Texas. In the West Ranch field of Victoria County near Vanderbilt, Magnolia is building a 25-27 million cubic foot gasoline plant. Production will be about 40,000 gallons daily of natural gasoline and LPG. In conjunction with other operators in the Seeligson field Magnolia is to build a $10 million cycling and gasoline extraction plant. About 60 million cubic feet of residue from this plant will be sold to Tennessee Gas and Transmission Co. and 150 million cubic feet will be returned to the producing formation.

Humble Oil & Refining Co. has been active in gasoline and cycling plant construction since the close of the war and still has a number of projects building. Cost of the Humble program will total $10 million. A recent completion was the 50 million cubic foot Clear Lake natural gasoline plant costing $2.25 million and producing 36,000 gallons of natural gasoline daily. Major plants now being built by Humble and its associates include the $3 million gasoline plant in the Tom O'Connor field of Refugio County, Texas, which will process 35 million cubic feet of gas daily and produce about 35,000 gallons of liquid products daily. A second is the 35-40 million cubic foot gasoline plant at Anahuac. This $2.5 million plant will be ready for operation by midsummer.



Pump room at Hawkins, Texas, plant of Natural Gasoline Corp. Richie photo.

In the Carthage gas field where a considerable number of large plants have been built during the past two years, Arkansas Fuel Oil Co. has decided to double the capacity of the 50 million cubic foot plant it is now completing.

Warren Petroleum Corp. is active in extending the service to producers at some of its plants. At the Fairbanks plant near Houston, Warren is installing six additional 600 hp. compressors to process an added 10-11 million cubic feet of gas and repressure the residue for return to producing formations. Since construction of the Holliday, Texas, plant, Warren has tied in additional gas from the East Holliday and Daume pools. This gas is being returned to the operators for reinjection. In Archer County Warren is working with producers on a repressuring program in the Hull-Silk district. This proposed plant would handle 10 million cubic feet daily.

Also in the North Texas area A. L. Ballard is

One of the large cycling plants erected during the war which went on stream this past year is Shell Oil Company's Sheridan, Texas, plant.

to build a natural gasoline, crude stabilization and pressure maintenance plant in conjunction with the Fred M. Manning interests in the Manning-O'Connor pool near Breckenridge.

Across the river in Oklahoma two plants have been announced. Skelly Oil Co. will build a gasoline plant in Stephens County, and Otha Grimes will build in the Coon Creek field near Arcadia, Okla.

Several important plants are being built in the Arkansas-Louisiana area. D. E. Buchanan, formerly of Hanlon-Buchanan, found that he couldn't stay out of the gasoline industry after all, even though he sold his former properties to Warren Petroleum Corp. less than a year ago. Mr. Buchanan has organized the Hiwon Oil & Gas Co. and will build an 8-12 million cubic foot gasoline plant in the Atlanta field near Magnolia, Ark., which will produce about 35,000 gallons of gasoline and LPG daily.

In north Louisiana Barnsdall Oil Corp. is building a 50 million cubic foot cycling plant in the Benton field in Bossier Parish. This plant will process gas from 15 wells in a 9,500-acre unit and produce about 4,000 barrels of distillate, natural gasoline and LPG daily. The plant will be ready for operation by December. Construction has begun on the $2.5 million gasoline plant of Sun Oil Co. in the Delhi, La., field which will process about 14.5 million cubic feet of gas daily. California Corp. is building a 100 million cubic foot cycling plant at Lake St. John, Tensas Parish, La., and a second plant in the Cranfield field, Adams County, Miss.

Phillips Petroleum Co. is building a new gasoline plant near Dumas, Texas, to process Panhandle gas for delivery to El Paso Natural Gas Co. This plant will have an initial capacity of about 60 million cubic feet and will be increased within a year or two to 110 million cubic feet. Contingent on development of gas markets in California, the Dumas plant may eventually reach a capacity of 180 million cubic feet.

In West Texas Phillips is enlarging its Fullerton plant as oil allowables and drilling permit. Company executives think that this process of expansion may continue for another six or seven years before a safe maximum is reached.

As a whole the natural gasoline expansion of Stanolind Oil and Gas Co. probably is the most spectacular in the Southwest and Rocky Mountain areas. Until the past few years, Stanolind has shown very little interest in the natural gasoline branch of the industry. Since the company began to expand its oil production, however, it has built up a natural gasoline and cycling. At the moment it is said that Stanolind is involved singly or as a partner in about 12 new gasoline. cycling and gas conservation projects in the Rocky Mountain and Southwestern areas. In addition to the three units previously mentioned which Stanolind will operate, the company is planning two plants in the Hugoton field with a combined capacity of 234 million cubic feet of gas and a liquid production of 109,000 gallons daily. One of these will be in connection with the synthol plant to be built to produce motor fuel from gas by synthesis. By the end of 1948 the Slaughter, Texas, plant will be operating with a natural and LPG capacity of 242,000 gallons daily, and the Elk Basin, Wyo., plant with a capacity of 47,000 gallons daily.

While the natural gasoline manufacturer is pleased with current markets for his products and thinks the next few years also look good, he is nevertheless appalled at his building cost figures on new projects. Before the war most manufacturers considered $30 per gallon of daily 26-70 capacity a reasonable cost for the average gasoline plant. This figure included housing for employees and other trimmings. Today costs are up 100 to 200 percent over prewar. Good permanent plants are costing $60 to $100 per gallon of daily 26-70 capacity. If markets didn't look so good, manufacturers would give their plant design engineers a good long vacation.

OIL COMPANY EARNINGS ROSE IN 1946

By HENRY E. ROSE

AN unexpectedly heavy demand for petroleum products, together with higher average prices for crude oil and refined products in the second half of 1946, gave a fillip to American oil company earnings last year. The result was that aggregate profits for the industry as a whole established a new high record in 1946. The sharp upsurge in the final half, in fact, offset moderate declines in profits which were experienced in the earlier part of the year.

Last year's earnings also were aided by the fact that special amortization charges against property and equipment, such as were made in 1945 incident to the war's end, were absent. These charges in some instances were of substantial size.

Giving effect to these combined factors, net profits of 23 leading companies used in WORLD PETROLEUM'S annual financial survey totaled $810,631,372 in 1946, an increase of 24 percent compared with the $655,492,429 earned in 1945. The previous record was $684,068,691 earned by these identical companies in 1944.

Applied to the 198,471,957 shares of common stock which were outstanding for these 23 companies at the year end, and after allowing for dividends paid on preferred stock outstanding for a few companies, the 1946 net profits were equal to $4.05 a share. They compared with $3.28 a share earned in 1945 on 196,569,816 shares and with $3.45 a share in 1944, the previous record year.

Profit gains were shown for 22 of the 23 companies—the one showing an unimportant reduction—and ranged from a few hundred thousand dollars to more than $23 million compared with 1945.

In reflection of the profit gains, the aggregate of dividends paid by the 23 companies to equity shareholders hit a new peak at $342,334,000 as against $307,134,000 in the previous year, an increase of 11.4 percent and $94,000,000, or 38 percent more than was disbursed by these companies in the prewar year of 1941.

Dividend payments to common stockholders last year represented 42.2 percent of the year's earnings, slightly less than the 47 percent disbursed in 1945.

In the current year demand for oil products has been maintained at peak levels which, together with better average prices, has been translated into substantial further gains in profits. During the first three months of 1947, for instance, 27 companies reporting for that period showed an increase of 60.9 percent in their net profits over 1946, the respective totals being $122,612,916 compared with $76,205,595. Table I, below, shows the first quarter profits of the 27 companies for this year and in 1946, with per share earnings on common stock.

This year's total demand for oil products, domestic and foreign, is expected to establish a new high of approximately 5,700,000 barrels daily, an increase of seven percent compared with 1946. During the first quarter of the year, demand approximated 5,850,000 barrels daily, an increase of 15 percent compared with the similar period in 1946 and five percent higher than the record during the first quarter of 1945. Demand for all oil products in the six months ended March 31 last was approximately 500,000 barrels a day larger than in the preceding six months.

The unprecedented demand for products during the 1946-1947 winter exceeded even the most optimistic forecasts because of a number of factors, including abnormally cold weather in the first quarter and a high rate of industrial production. To meet demand for 1947 and making allowance for a recession in business later in the year, it is estimated that the industry will have to produce 5,000,000 barrels of crude oil a day domestically and it will require, in addition, about 350,000 barrels of natural gasoline and condensate and imports of about 450,000 barrels of oil a day.

With such a demand outlook and with the industry at practical capacity operation, there is little expectation of a general price recession. Aside from this, the industry faces the necessity of undertaking a major program of plant expansion at costs materially higher than those in prewar times.

Large capital outlays must be made for new facilities in all divisions of the industry in this country and abroad, therefore, in order to meet the expanding demands that lie ahead. Annual expenditures for plant and equipment are likely to be considerably above normal for some time. The need for immediate large capital outlays, in fact, already has been announced by the heads of many leading companies.

While earnings appear to be relatively high at present, a major part of these higher profits will have to be reinvested in plant and other permanent assets. Dividend payments to common stockholders, for this reason, will not rise in proportion to the gains in profits, although moderately higher payments may be expected. In fact, several have already been announced this year. Standard Oil Co. (N. J.) early in May declared a dividend of $2, discontinuing the practice of declaring a semi-annual and an extra as it did in 1946 of 50 cents and $1 respectively. It said, moreover, that the $2 payment doesn't mean that the company is on a $4 annual basis.

Standard Oil Co. of California lifted its quarterly dividend to 85 cents from 65 cents paid in

TABLE I
Income of 27 Oil Companies, Three Months Ended March 31

	1947		1946	
	Net Income	Per Share On Common	Net Income	Per Share On Common
Amerada	$3,257,629	$2.07	$1,463,072	$ .93
Anderson Pritchard	687,855	1.03	511,136	.75
Atlantic	2,764,568	.95	1,902,237	.62
Barnsdall	2,664,542	.75	1,022,406	.46
Continental	6,559,705	1.38	2,606,354	.56
Derby Oil	197,473	.73	60,522	.26
Houston	883,510	.80	651,238	.51
Lion Oil	1,391,216	2.38	307,783	.71
Louisiana Land & Ex.	839,732	.28	505,432	.17
Mid-Continent	3,869,129	2.08	2,313,826	1.25
Ohio	5,891,915	.90	3,981,762	.61
Phillips	6,210,355	1.26	4,244,932	.86
Plymouth	2,105,239	2.01	1,730,759	1.65
Quaker State	890,954	.96	612,120	.66
Root	260,421	.77	68,250	.20
Seaboard	1,175,857	.95	395,719	.32
Skelly	2,923,654	2.98	1,628,302	1.65
Shell Union	10,877,071	.81	7,727,503	.57
Standard (Calif.)	18,493,967	1.42	14,530,519	1.13
Socony-Vacuum	*19,000,000	.61	*11,000,000	.35
Sunray	2,066,464	.38	448,283	.13
Texas Co.	**18,582,445	1.65	11,214,961	1.00
Texas Pac. Coal & Oil	692,864	.78	348,027	.39
Tide Water	5,180,274	.77	3,744,555	.54
Union	3,550,631	.71	1,815,492	.34
Universal Consolidated	193,537	1.04	53,810	.29
Warren	1,401,909	2.33	316,595	.53
TOTAL	$122,612,916		$76,205,595	

* Official estimate.
** Excludes dividends of approximately $11,000,000 received from a non-subsidiary (Arabian American Oil Co.) operating in the Middle East.

three preceding quarterly periods, while Barnsdall Oil Co. declared an extra of 15 cents in addition to the quarterly of 25 cents in May.

As against these larger payments of dividends, Sinclair Oil Co. stockholders were told that the company's present rate of $1 a share a year "is all the company can prudently pay when all factors are considered."

For all of 1946, fourteen of the 23 companies in the WORLD PETROLEUM tabulation disbursed more dividends per share than in 1945, the remaining nine paying out the same amount. Of those disbursing more, Standard Oil Co. (N. J.) headed the list with payments totaling $82,001,226 against $68,334,332 in 1945. It was followed by Texas Co. which paid $33,733,980 against $28,111,650; Standard of California, $29,909,092 against $26,007,906; Humble Oil & Refining, $29,210,480 against $26,963,520; Standard of Indiana, $26,748,791 against $22,927,295; Socony-Vacuum, $23,383,792 against $20,265,910; Gulf $22,690,505 against $18,152,404. Shell Union paid $20,205,938, the same as in 1945.

Other companies that increased dividend payments last year include Amerada, Barnsdall, Continental, Mid-Continent, Ohio, Pure and Standard of Ohio; the latter in addition to paying $1 in cash distributed a two percent stock dividend.

Largely in reflection of the need for additional capital to provide for expanded facilities and for working purposes, there was an increase in the aggregate long-term debt of eighteen companies having such obligations. This debt stood at $1,109,403,000 at the close of 1946, a new high record, and an increase of $156,457,000 compared with the $952,946,000 outstanding for 19 companies a year previously. Seaboard Oil Co., which had $1,733,333 outstanding at the close of 1945, paid off this debt during 1946.

The increase in total debt was accounted for by six companies. Gulf increased its obligations to $79,672,985 at the close of 1946 from $49,360,719 a year earlier. Early this year Gulf sought approval from stockholders to borrow $200,000,000 for expansion purposes and did effect the borrowing of $100,000,000 from the Equitable Life Assurance Society for 25 years at a rate of 2½ percent.

Standard Oil Co. of Indiana, which showed a debt of $19,303,041 at the close of 1945 increased it to $66,982,830 a year later. It made arrangements with the First National Bank of Chicago and eleven other banks for borrowings of $50,000,000 in 1946, of which $40,000,000 had been taken down by the year end. The remaining $10,000,000 was borrowed by February of this year. These additional funds will be used to defray the costs of a large expansion program. Texas Co., another of the companies to show an increase in funded debt, amounting to more than $33,000,000 and lifting its debt to $147,093,063, sold an issue of debentures in August, 1946, to a group of institutional investors, adding the proceeds to general working funds.

Other companies to show larger debts last year included Shell Union and Socony-Vacuum Oil Co., the latter reporting such debt at $125,000,000 of which $25,000,000 was due to Standard-Vacuum Oil Co., in which Socony has a 50 percent interest.

Principal changes in capital stock positions of leading companies included an offering, early this year, by Atlantic Refining Co. of $25,000,000 of preferred stock, part of 900,000 such new shares authorized by stockholders who voted a merger of Point Breeze Manufacturing Co. a wholly-owned subsidiary, into Atlantic for purposes of recapitalization. Proceeds from the sale of this preferred stock were added to the company's general funds.

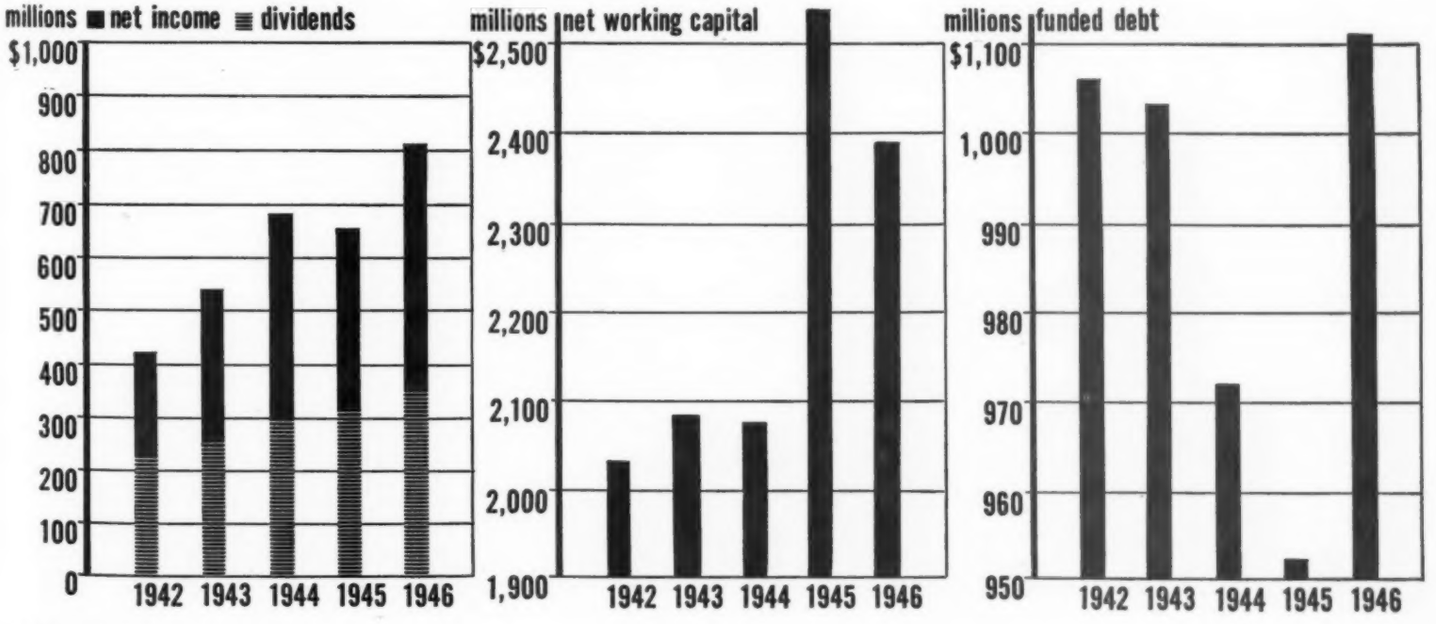
Sun Oil Co. stockholders in March last approved an increase in authorized common stock to 5,000,000 shares, from 4,100,000, for the purpose of splitting on the basis of six shares for each five held. Following the split there will be 4,136,209 shares outstanding. The split-up, it was announced, was to give stockholders more than the $1 annual cash dividend through a stock dividend or split-up of shares.

Although earnings of the companies in 1946 were at a new record and a smaller portion of such earnings was paid out in cash dividends that in 1945, the working capital position of the 23 companies showed a reduction of $149,000,000, largely in reflection of the reinvestment of earnings in permanent assets.

At the end of 1946 the working capital totaled $2,389,253,102 against the peak of $2,538,762,000 a year earlier. Decreases were shown by 13 companies and increases by ten.

In the tabulation on page 52 is shown the net earnings, working capital, funded debt, surplus and other financial data for 23 American oil companies for 1946 and four previous years. In addition there is included the same material for two companies operating in foreign territory; namely, Imperial Oil, Ltd., and Creole Petroleum Corp.

Chart showing changes in net income, dividends, net working capital and funded debt of principal oil companies in recent years.



FIVE YEARS FINANCIAL REVIEW OF

	Net Income	Per Share of Com.	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
Amerada Corp.								
1946	$3,855,975	$5.61	$12,911,224	$20,086,891	.....	.....	(E) 1,577,350	$21,459,134
1945	5,396,770	6.84	9,471,634	17,225,600	.....	.....	788,675	15,590,716
1944	5,285,988	6.70	8,566,051	15,927,801	.....	.....	788,675	13,585,670
1943	4,781,771	6.06	8,615,413	13,434,753	.....	.....	788,675	10,665,707
1942	3,271,885	4.15	5,542,107	12,714,027	.....	.....	788,675	7,461,287
Atlantic Refining Co.								
1946	9,632,926	3.26	43,317,784	205,560,012	37,211,229	148,000	2,663,998	121,547,694
1945	1,509,107	.34	46,293,657	189,688,970	40,179,220	148,000	2,663,998	115,626,758
1944	14,710,913	5.30	45,675,417	192,279,722	31,009,123	148,000	2,663,998	118,061,797
1943	10,687,828	3.79	44,630,707	180,655,671	32,632,928	148,000	2,663,998	105,669,589
1942	6,800,002	2.33	53,403,548	158,643,694	26,305,709	148,000	2,663,998	96,943,179
Barnsdall Oil Co.								
1946	5,113,811	2.30	9,056,280	19,222,629	.....	.....	2,223,307	17,666,642
1945	4,389,779	1.97	6,533,192	17,798,321	.....	.....	2,223,307	13,717,216
1944	3,674,766	1.65	5,498,163	15,977,894	.....	.....	2,223,307	10,861,185
1943	3,602,764	1.62	5,546,689	14,233,620	.....	.....	2,223,225	9,024,509
1942	2,801,846	1.26	3,752,756	14,139,303	.....	.....	2,223,579	7,109,812
Continental Oil Corp.								
1946	19,013,899	4.05	30,935,190	109,472,845	1,118,925	.....	4,694,251	123,359,887
1945	15,142,870	3.23	21,367,915	107,941,335	2,101,890	.....	4,682,557	111,885,294
1944	12,020,527	2.57	30,132,843	88,999,748	1,518,244	.....	4,916,987	103,234,221
1943	14,080,702	3.00	32,727,198	82,290,941	2,806,743	.....	4,682,561	100,004,761
1942	14,924,698	3.19	27,954,923	82,045,727	5,859,055	.....	4,682,563	91,806,436
Creole Petroleum Corp.								
1946	83,305,686	3.13	55,563,445	233,193,158	.....	.....	26,606,610	142,329,526
1945	64,601,781	2.43	47,301,411	169,296,022	.....	.....	26,606,610	105,585,408
1944	62,020,396	2.33	37,850,361	166,578,162	.....	.....	26,606,610	74,241,889
1943	(B) 28,559,169	1.07	20,788,692	154,684,278	.....	.....	26,606,610	45,479,756
1942	3,469,000	.50	4,360,149	75,539,403	.....	.....	6,974,356	45,720,611
Gulf Oil Co.								
1946	58,284,830	6.42	83,221,420	485,799,531	59,672,985	.....	9,076,202	225,865,332
1945	45,213,640	4.98	91,459,870	446,736,575	49,360,719	.....	9,076,202	208,315,592
1944	42,075,513	4.64	101,635,902	409,833,584	48,443,118	.....	9,076,202	181,254,656
1943	29,301,053	3.29	101,190,142	382,301,066	52,992,991	.....	9,076,202	153,516,655
1942	22,981,562	2.53	79,139,104	378,603,898	42,912,760	.....	9,076,202	137,829,905
Humble Oil & Refining Co.								
1946	71,831,758	4.00	92,101,800	437,500,998	42,739,798	.....	17,975,680 (F)	189,474,719
1945	70,895,006	3.94	101,848,186	384,198,125	43,613,457	.....	17,975,680	269,853,441
1944	60,525,774	3.37	82,299,423	353,559,531	42,662,491	.....	17,915,680	221,796,955
1943	45,711,511	2.54	70,668,062	341,516,999	55,533,744	..... (E)	17,975,680	182,234,701
1942	29,243,303	3.25	56,022,566	336,571,341	52,570,414	..... (D)	8,987,840	164,992,790
Imperial Oil, Ltd.								
1946	17,326,112	.64	61,532,933	54,862,144	.....	.....	26,965,078	65,549,119
1945	16,616,586	.61	74,521,062	38,333,859	.....	.....	26,965,078	59,286,892
1944	16,192,670	.60	74,702,544	38,879,829	.....	.....	26,965,078	59,441,568
1943	15,548,873	.57	69,604,722	40,455,813	.....	.....	26,965,078	56,345,318
1942	14,663,097	.54	60,583,509	44,826,797	.....	.....	26,965,078	54,021,208
Mid-Continent Petroleum Corp.								
1946	10,084,581	5.43	36,546,658	44,163,951	.....	.....	1,857,912	61,578,530
1945	8,062,792	4.34	34,329,652	41,594,097	.....	.....	1,857,812	56,581,775
1944	6,942,033	3.74	35,820,077	37,201,893	.....	.....	1,857,912	54,341,053
1943	6,566,618	3.53	32,729,621	36,450,773	.....	.....	1,857,912	50,583,350
1942	6,112,158	3.29	30,603,308	35,443,077	.....	.....	1,857,912	47,465,394
Ohio Oil Co.								
1946	18,253,236	2.78	42,575,885	81,024,999	8,000,000	.....	6,563,377	41,379,020
1945	13,949,822	2.13	37,001,770	79,673,840	9,500,000	.....	6,563,377	51,804,212
1944	15,082,127	2.30	30,683,091	80,316,287	11,000,000	.....	6,563,377	44,417,766
1943	14,146,802	2.14	26,347,464	76,236,983	12,500,000	.....	6,563,377	35,899,013
1942	12,508,953	1.74	22,779,178	80,310,995	12,500,000	57,046	6,563,377	31,015,260
Phillips Petroleum Co.								
1946	22,625,151	4.60	44,550,509	236,560,087	43,833,211	.....	4,916,987	94,182,086
1945	22,571,509	4.50	42,310,294	222,698,646	45,989,518	.....	4,916,987	81,390,909
1944	20,952,088	4.26	30,752,672	235,972,999	48,812,688	.....	4,916,987	68,853,374
1943	14,168,422	3.04	24,494,808	205,917,876	28,707,826	.....	4,916,987	57,535,250
1942	13,129,457	2.95	33,630,615	188,723,195	38,608,431	.....	4,492,980	52,739,178
Pure Oil Co.								
1946	17,107,961	3.74	52,638,916	136,931,651	.....	442,434	3,982,033	82,013,518
1945	13,581,770	2.64	55,486,989	126,537,915	.....	442,434	3,982,031	72,094,085
1944	16,392,178	3.11	40,060,767	(A) 133,029,554	2,415,806	725,431	3,982,431 (A)	67,813,020
1943	13,874,517	2.50	32,089,974	151,721,887	2,829,457	725,431	3,982,031	78,833,591
1942	13,761,826	2.47	30,915,653	126,026,907	3,174,175	725,431	3,982,031	71,853,446
Seaboard Oil Co.								
1946	3,000,586	2.43	4,769,046	8,557,413	.....	.....	1,234,232	10,133,008
1945	2,720,022	2.20	3,332,211	8,508,948	1,733,333	.....	1,234,233	6,663,989
1944	1,881,284	1.52	3,452,654	7,841,302	2,433,333	.....	1,234,235	5,178,190
1943	1,949,096	1.58	4,512,666	7,410,791	3,040,000	.....	1,234,237	4,097,062
1942	1,463,706	1.18	3,314,271	7,620,841	3,440,000	.....	1,234,252	3,816,255

UNITED STATES OIL COMPANIES

	Net Income	Per Share of Com.	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
Shell Union Oil Corp.								
1946	$32,880,417	$2.44	$179,579,959	$191,962,583	$124,000,000	.....	13,470,625	$83,253,766
1945	28,712,328	2.13	146,416,443	175,254,538	81,641,000	.....	13,470,625	50,579,277
1944	28,165,961	2.09	114,096,944	213,471,518	84,873,000	.....	13,470,625	50,404,897
1943	24,542,556	1.82	90,151,050	222,510,924	94,135,000	.....	13,470,625	42,446,874
1942	16,860,007	1.28	95,774,423	199,551,494	104,278,000	.....	13,070,625	34,086,647
Sinclair Oil Corp.								
1946	27,607,645	2.30	148,524,551	242,091,785	108,431,680	.....	11,924,041	245,819,783
1945	15,644,749	1.30	158,722,855	213,268,030	110,475,065	.....	11,974,058	230,182,487
1944	27,367,794	2.28	92,255,494	241,573,524	61,706,525	.....	11,974,094	226,508,979
1943	23,083,709	1.85	89,494,580	239,682,758	66,801,857	.....	12,928,205	209,148,169
1942	18,060,598	1.42	101,393,765	216,238,349	92,395,928	.....	13,651,405	193,038,459
Skelly Oil Co.								
1946	10,108,765	10.30	16,291,391	74,599,381	16,400,000	.....	981,348	59,250,404
1945	8,531,274	8.69	16,597,603	67,161,858	17,200,000	.....	981,349	51,104,336
1944	7,222,903	7.36	11,541,852	58,319,784	10,000,000	.....	981,349	44,535,759
1943	5,461,708	5.56	11,772,045	53,808,491	11,200,000	.....	981,349	39,154,199
1942	5,632,805	5.73	11,863,363	52,375,519	13,600,000	.....	981,348	35,164,513
Socony-Vacuum Oil Co., Inc.								
1946	58,310,569	1.87	266,082,299	577,619,321	125,000,000	.....	31,178,323	379,813,495
1945	42,301,983	1.36	274,222,734	509,955,895	100,315,279	.....	31,178,323	321,695,393
1944	62,349,556	2.00	280,510,156	511,462,505	118,077,823	.....	31,708,452	229,990,725
1943	35,944,983	1.15	271,335,854	499,503,866	126,716,312	.....	31,708,452	191,024,911
1942	30,808,397	.99	234,062,698	481,070,509	123,674,996	.....	31,708,452	170,669,089
Standard Oil Co. of California								
1946	66,956,611	5.15	90,373,940	519,861,157	40,000,000	.....	13,003,953	330,734,788
1945	55,548,628	4.27	113,442,810	473,027,029	38,500,000	.....	13,003,953	284,503,528
1944	43,467,997	3.34	122,616,220	466,865,826	40,000,000	.....	13,003,953	260,871,854
1943	36,116,060	2.78	111,393,415	466,335,156	40,000,000	.....	13,003,953	245,657,323
1942	30,558,547	2.35	93,310,560	470,851,310	40,000,000	.....	13,003,935	239,748,878
Standard Oil Co. of Indiana								
1946	67,649,785	4.43	189,970,915	637,231,383	66,982,830	.....	15,284,830	478,439,433
1945	50,340,476	3.29	222,713,624	530,228,098	19,303,041	.....	15,284,860	437,538,439
1944	59,225,578	3.87	181,904,301	539,352,256	12,042,641	.....	15,284,864	409,881,287
1943	50,591,371	3.31	186,639,059	498,147,998	17,537,965	.....	15,284,876	377,781,563
1942	44,183,893	2.89	203,989,055	443,433,258	16,453,283	.....	15,284,892	348,050,454
Standard Oil Co. (N. J.)								
1946	177,609,931	6.59	739,031,209	1,274,429,578	198,206,986	.....	27,333,742	971,978,685
1945	154,156,196	5.64	779,818,746	1,137,441,311	203,129,907	.....	27,333,742	857,287,258
1944	155,396,460	5.69	697,078,843	1,103,125,811	214,855,260	.....	27,333,742	697,078,482
1943	121,327,773	4.45	585,859,209	1,092,251,188	232,157,560	.....	27,283,587	672,584,273
1942	83,361,920	3.06	495,667,607	1,104,036,333	248,072,906	.....	27,253,587	642,011,449
Standard Oil Co. of Ohio								
1946	10,324,797	3.43	30,662,528	84,744,061	16,711,835	252,000	(C) 2,737,074	50,138,079
1945	3,713,161	1.10	39,045,305	76,463,002	16,566,863	238,665	(C) 2,676,283	43,686,806
1944	6,744,014	7.07	24,173,817	74,989,555	20,199,617	221,389	807,585	41,466,795
1943	4,905,634	5.68	20,098,777	67,853,801	22,179,387	221,389	758,519	37,729,768
1942	5,649,880	6.68	26,286,564	57,335,786	23,151,743	120,000	756,265	34,437,272
Sun Oil Co.								
1946	14,726,551	4.17	49,662,405	114,622,553	6,750,914	93,197	3,434,944	38,452,703
1945	15,666,543	4.44	47,936,056	102,480,572	4,588,218	93,197	3,434,944	25,795,504
1944	13,350,217	4.15	60,254,429	110,955,911	34,739,756	93,197	3,119,532	27,344,493
1943	13,353,524	4.56	59,380,803	104,366,531	35,894,794	93,197	2,838,929	27,062,509
1942	8,671,050	2.91	50,339,826	99,510,033	29,025,154	93,107	2,838,929	18,263,495
The Texas Co.								
1946	71,089,267	6.32	131,027,329	413,883,965	147,093,063	.....	11,244,660	359,482,341
1945	51,856,928	4.61	186,332,038	398,787,324	114,498,906	.....	11,244,660	316,801,859
1944	54,516,819	4.85	176,565,106	431,780,673	124,600,469	.....	11,244,660	293,056,581
1943	42,889,797	3.83	176,654,852	415,353,085	123,998,331	.....	11,186,279	265,299,559
1942	35,060,001	3.32	174,619,189	368,886,617	106,000,000	.....	10,875,627	237,718,261
Tide Water Associated Oil Co.								
1946	19,757,707	2.93	50,735,936	140,154,130	7,250,000	268,778	6,396,809	98,842,428
1945	18,107,712	2.57	48,056,917	140,459,899	14,250,000	287,887	6,396,809	84,937,733
1944	17,787,202	2.43	49,971,786	147,485,770	21,250,000	500,000	6,386,809	81,118,436
1943	14,902,640	1.98	58,391,066	133,722,641	30,436,400	500,000	6,389,394	50,267,921
1942	10,663,930	1.32	49,561,629	134,115,502	33,436,400	500,000	6,375,364	42,890,964
Union Oil Co. of California								
1946	9,804,523	1.90	45,265,932	166,822,441	40,000,000	250,000	4,666,270	37,570,420
1945	9,201,123	1.87	56,487,921	154,637,919	40,000,000	250,000	4,666,270	33,399,667
1944	8,932,994	1.91	34,357,126	168,599,514	53,700,000	.....	4,666,270	32,248,766
1943	7,269,199	1.56	41,071,274	144,962,486	42,544,000	.....	4,666,270	27,525,466
1942	5,537,329	1.19	48,758,124	133,893,458	43,639,000	.....	4,666,270	24,249,828

(A) Giving effect to writeoffs in November, 1944, of $19,523,031 of patents, rights, trademarks, etc.
(B) Adjusted to give effect to Lago Petroleum Corp. earnings for all of 1943.
(C) Common stock split 2- for 1 in 1945.
(D) Stock split two-for-one late in 1943, and per share net is on larger share basis.
(E) Stock split two-for-one early in 1946.
(F) After transferring $124,445,088 of prior year's earnings to capital stock account which is now carried at $300,000,000 against $175,000,000 at December 31, 1945.

PUBLIC RELATIONS CAMPAIGN CALLS FOR FULL INDUSTRY PARTICIPATION

FOLLOWING the meeting of the Public Relations Operating Committee of the American Petroleum Institute held in New York early in May, the campaign to put before the general public essential facts regarding the oil industry and to correct some widely held misconceptions regarding it is now in its active stage. A great amount of preliminary spadework has been necessary in order to determine the ground to be covered, to prepare the material to be used and to effect a working organization among the membership of the industry on whose cooperation the effectiveness of the campaign will depend.

First of these preliminary steps was the study conducted last year by Opinion Research, Inc., to discover what the average American really thinks of the oil industry and in what respects his beliefs regarding it are mistaken or deficient. The results of this survey were incorporated in a report submitted at the annual meeting of the American Petroleum Institute in November last under the title, "Those Who Know You Well Think Well of You," which has since been widely circulated in the industry. The inquiry revealed that the great majority of those questioned have no serious criticism to make of the service rendered by the industry or the prices charged for its products; two out of five believe that it is dominated by a few large companies, while a still smaller proportion has knowledge of the money and effort devoted by the industry to the improvement of its products and the lowering of their cost.

On the debit side of the survey's balance sheet were the following impressive statistics:

48,000,000 Americans accept the charge that oil companies get together to "fix" prices;

28,000,000 think of the industry as a monopoly;

21,000,000 say oil companies hold back new developments;

18,000,000 believe the industry makes too much profit;

13,000,000 favor government ownership and operation.

On the favorable side was the showing that the great majority of the country's 84,000,000 adults is satisfied with the products supplied, the prices charged and the services rendered by the industry, and the significant fact that the more people know about the oil business, the more favorably they regard it. For example, the 10 million Americans who think there are fewer than ten oil companies are far more inclined to favor nationalization than the 11 million who estimate that there are more than 100 companies in the field; while only 69 percent of the public has a generally favorable impression of the oil business, 94 percent of oil workers, who know the industry best, have such an impression.

On the basis of a careful statistical analysis of the survey, it was decided that petdoleum's foremost task is to establish a clearer understanding of the industry's operations among the great numbers of the ill-informed as the best means of maintaining sound conditions and neutralizing sentiment for government control. Specific means proposed to carry out this campaign of enlightenment include the following:

(1) Convince the public that petroleum promotes progress and a higher standard of living by the very nature of its highly competitive, free enterprise structure.

(2) Bolster this conviction by an educational program presenting the facts about oil before the "planned economy" concept has a chance to take deeper root in the country.

(3) Depend to a great extent on the million and a quarter workers in the oil industry—the men and women who know most about its activities and are, therefore, most inclined to approve them—to tell the petroleum story to the public.

The decision to use progress as the watchword for the public relations program was based on the belief that it paints a true picture of the industry and that it can do the same yeoman service in peacetime that the slogan, "Oil is Ammunition," did during the war. For example, the characterization offsets the impression some have that the industry holds back new developments. Obviously a progressive industry does not hold back. It goes forward. It improves old products. It pioneers with new ones.

As for the educational campaign, it will be bulwarked by facts such as these: Oil companies spend $50,000,000 annually on research; last year refiners led the automobile, railroad, steel, electric utility and chemical industries in average weekly earnings paid employees; the percentage yield of gasoline from crude oil has been doubled since 1915, at the same time that prices have greatly declined and quality has improved.

Competition in oil will be highlighted by showing that there are 13,475 companies in the production end of the business; 400 in refining; 650 engaged in transporting oil or oil products, and 20,000 dealing with wholesale marketing and distribution, plus nearly a quarter million privately owned or leased service stations and tens of thousands of other retail outlets.

Emphasis will be laid on the fact that the oil industry does everything possible to conserve the nation's crude oil resources by widespread exploration and such techniques as cycling and water and gas pressuring of new and old wells; that its profits are considerably lower than the

Humorous type copy is used in many of the advertisements.

"He bet there weren't more than 200 oil companies in the U. S. A."

It's hard to believe, but actually there are more than 34,000 different oil companies in America.

About 13,475 of these are in production, 650 in transportation, 400 in refining, and 20,000 in distribution (in addition to about 225,000 service stations).

Because there are so many companies in this progressive industry, the competition is healthy and *intense*.

That's one big reason why we can offer you such fine petroleum services and products at such reasonable prices!

Your Name Goes Here

Petroleum Promotes Progress

average for other leading industries; that it produces or provides materials for some 5,400 products and by-products which contribute immeasurably to the health, happiness and high standard of living of all Americans.

Organization of the campaign within the industry was launched at Chicago last November when a Public Relations Committee of 33 members was appointed with John M. Lovejoy, president of Seaboard Oil Company as chairman. A Public Relations Operating Committee of 22, now chairmaned by Franklyn Waltman of the Sun Oil Company, was asked to draw up a plan for the program and to supervise its development. The November meeting also laid down the rule that the program should concentrate only on problems affecting industry-wide relations with the general public. It makes no attempt to sell a single gallon of gasoline or any other petroleum product.

Since that time the fundamentals of the plan have been presented to meetings of oil men in the various sections of the country and have elicited immediate and widespread support from all segments of the industry. Eleven district committees made up of some 600 oil men have been organized, and it is planned to enlarge membership of these committees to approximately 1,000 representatives throughout the nation.

Steps to carry the program directly to the public were decided upon at the May meeting of the Operating Committee. At that meeting an illustrated campaign brochure entitled, "Winning More Friends for Your Business," was presented to committeemen and approved for distribution to the district committees. The brochure provided for posters, leaflets, pamphlets, radio commercials, advertisements and speeches to be used by participating companies and trade associations.

An accompanying "use plan" suggested that:

Companies make the broadest possible use of available advertising copy in local newspapers, in other publications and on radio programs.

Window cards and posters be placed at all vantage points on company property, service stations and available public places where they will serve the two-fold purpose of informing employees and the public of oil's progressive policies.

Company representatives deliver suggested speeches or adaptations thereof from as many forums as possible in every community.

All media be used to repeat variations of the industry theme—Petroleum Promotes Progress. Such media to include not only newspaper and radio advertisements but company stationery, postage meters, standard forms and salesmen's calling cards.

A prepared fact sheet of industry statistics be used to present a true picture of oil's accomplishments and potentialities to employees and the general public through house organs, advertising and promotional material originated by companies and trade associations.

The campaign brochure with its advertising material, fact sheet and other aids is being distributed throughout the industry and the services of field representatives are available to district committees for consultation as to the best method of use in their localities. The publicity material is intended to suggest similar material and to supply data which can be incorporated by companies in their announcements or by individual speakers in their talks. The advertising copy is presented in various forms so that slogans can be incorporaated in the advertising of individual companies or special advertisements may be carried over company names. The Public Relations Operating Committee feels very strongly that the effect of the campaign will depend largely upon the extent to which it is supported by trade associations, companies and individual members of the industry through channels they possess for reaching the public in local communities.

Other advertisements are designed to increase the public's knowledge of the industry.

HOW

...many different products have been developed from crude oil by the petroleum industry? All told, about 5400—everything from gasoline and fuel oils to materials for plastics, medicines, cosmetics and synthetic rubber. That's because the petroleum industry is progressive, alert and intensely competitive! We're proud to be a member of this great industry—an industry that offers an unlimited supply of great petroleum products at such reasonable prices!

Your Name Goes Here

Petroleum Promotes Progress

A page from the brochure soliciting cooperation of oil men.

Here are some things <u>YOU</u> can do:

1. Talk up the program
2. Run newspaper advertisements
3. Sponsor radio commercials
4. Make speeches
5. Put up plant posters
6. Display window cards
7. Send direct mail messages
8. Have "Petroleum Promotes Progress" put on your postage meter
LET'S GO!

COMBATTING CORROSION FATIGUE FAILURES BY PLASTIC COATING OF DRILL PIPE

By Dr. L. E. Trishman*

THE necessity for overcoming corrosion fatigue failures in oil well drill pipe has long been recognized by engineers. The first failures which were definitely recognized as corrosion fatigue in character were brought to the attention of our field engineers in 1935. Since that time, a close study of the contributing causes has been made. It was found that drilling with the pipe under compressive load by letting the drill string rest on the bit was one of the chief causes contributing to early failure by corrosion fatigue. Such practice, it was found, can cause early failure by "pure" fatigue even when serious corrosive conditions are not present. However, when bad drilling practice is corrected, corrosion fatigue failures still continue to take place, in certain corrosive areas, although not so frequently.

The drilling mud, as it is pumped down the pipe and up the annular space around the pipe, dissolves corrosive substances from the various formations in the earth and thereby becomes a corrosive liquid toward the steel pipe. Thick salt beds, limestone formations and sulphides make certain areas of the United States particularly corrosive towards drill pipe. Drillers call such areas "hot spots" because of the large number of corrosion fatigue failures encountered when drilling in these areas.

"Pure" fatigue failures, and in many cases notch fatigue failures, can be prevented by careful handling and use of the pipe. Even corrosion fatigue failures can be minimized by careful drilling practice, but no amount of careful handling can stop corrosion fatigue failures. The only way they can be stopped is to prevent the corrosion.

A very great percentage of fatigue failures develop from the inside of the pipe outward, the fatigue cracks originating at corrosion pits in the inside surface. Several reasons have been advanced to explain this. A very popular reason is that the pipe in rotating in the hole is constantly being polished by wiping against the hole wall and by rotating in the mud slurry which also acts as a polishing material. Obviously, corrosion pits cannot develop on a surface which is constantly polished. Therefore, no pits develop to act as notches for the beginning of corrosion fatigue cracks. Within the pipe the mud adjacent to the pipe wall is more or less quiescent in relation to the pipe wall and corrosive attack can take place. Also the mud within the pipe, the upper portion at least, has just passed through the screens which act as an aerating device, thereby enriching the mud with oxygen which aids corrosion.

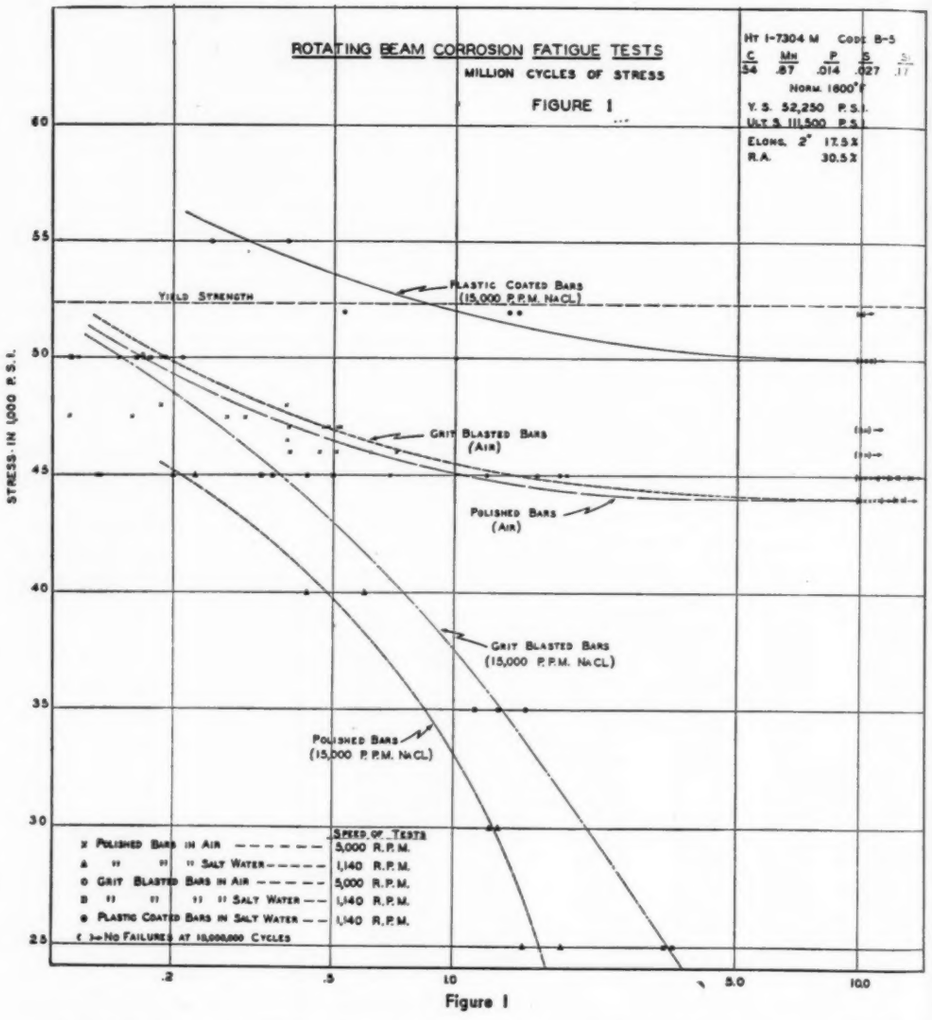


Figure 1

Regardless of how the corrosion fatigue failures get started, it is known by close observation that most of them originate at the inside surface. Many corrosion fatigue cracks have been found in lengths of pipe on the inside where none appeared on the outside. Figures 2, 3 and 4 are representative of corrosion and corrosion fatigue cracking found in drill pipe which had been in service without any protection applied to the pipe.

Since corrosion fatigue failures of drill pipe appear to originate from the inside, little benefit would be gained by coating the outside of the pipe in addition to the inside. It is doubtful if a protective coating would remain long on the outer surface because of the abrasion encountered. furthermore, a coating on the outside might "gum up" the jaws of tools applied to the pipe. Slippage of tool jaws could be dangerous.

The choice of a satisfactory coating depends upon several factors:

(1) The coating must be impervious. Many

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coating materials cannot be applied free of pin holes, porosity or fine cracks.

(2) Oil resistance is required.

(3) Resistance to mild chemical attack is necessary. Some drilling muds are alkaline. Others become acid from sulphides picked up in drilling.

(4) The coating should not soften or deteriorate up to 300-350° F. Bottom hole temperatures become very high in some deep wells.

(5) Resistance to mild abrasion is necessary.

(6) The coating must not be brittle. A brittle coating might crack or flake when pipe becomes bent or is subsequently straightened.

(7) The coating material must have chemical stability. It must not oxidize in contact with the air or deteriorate to such an extent that it would become chalky or flake off.

(8) It must adhere well to the surface of the pipe.

(9) It must not change the physical properties of the surface of the pipe.

(10) The coating must be easy to apply inside of the pipe. Satisfactory coating materials have been found which could not be applied inside pipe in lengths as long as drill pipe.

The properties of many coating materials were studied before suitable ones were found which could be tested under corrosion fatigue conditions. Two were found which gave satisfactory results in laboratory corrosion fatigue tests. One was an air-drying phenolic plastic coating and the other a baking-type (thermo-setting), phenolic base, plastic. Both gave such outstanding results that it was decided to try them in experimental strings of drill pipe in field tests.

Laboratory corrision fatigue tests were made using a rotating-beam fatigue machine with aerated salt water of 15,000 parts per million of salt as the corrosive. A low speed motor of 1,140 RPM was used to drive the machine for the corrosion tests. When comparison tests in air (non-corrosive) were made, the machine was driven at 5,000 RPM to reduce the time of testing. For the corrosion tests the salt solution was pumped through a nozzle which sprayed the salt water over the rotating bar. The system was arranged with a motor-driven aspirator bulb as the pump and all equipment, such as the cell surrounding the test bar, was made so that no metal except the test bar came in contact with the solution. In this way the salt water was pumped from the supply bottle, sprayed over the test bar, and returned to the supply bottle to make a complete circuit. At intervals the salt water was changed.

Results of fatigue tests under different conditions are given in the curves of Figure 1. The curves for the uncoated bars tested in air show that the bars break under reversed bending stresses at only 100,000 to 200,000 reversals at an applied stress of 50,000 pounds per square inch. At 46,000 pounds per square inch the bars will run to about a half million reversals, but at or below 44,000 pounds per square inch the bars will not break at 10,000,000 reversals. Engineers consider that a test that runs for 10,000,000 or more cycles will run almost indefinitely without breaking. The stress at which this takes place is called the endurance limit of that steel under the imposed conditions. It is indicated by the Stress-Number of Cycle curves flattening out and for all practical purposes become horizontal. Note how the S-N curves turn downward under corrosive conditions when salt water is pumped over the test bars. These curves show that under corrosive conditions an endurance limit cannot ever be reached. Applying the knowledge gained from these tests to drill pipe, it means that without corrosion, if such a condition could be obtained, a string of drill pipe could be used without fatigue failure until it wore out, if the stress in the pipe were kept below the endurance limit load for that particular steel. However, if corrosive mud comes into contact with the pipe, corrosion fatigue failure may occur in as few as one to five million revolutions in the hole. This figure will be higher the lower the stress applied to the pipe. This brings out the reason why a driller should apply weight to the bit by use of a sufficient number of drill collars and not by letting the pipe "rest" on the bit. As soon as the driller lets the weight of the pipe add weight to the bit, he is subjecting a certain length of his pipe to end loading which makes the pipe bend and flex like an overloaded column, placing heavy bending stresses on the pipe wall. The higher these bending stresses, the sooner the pipe will fail by corrosion fatigue. This accounts for the statement at the beginning of this article that good drilling practice can minimize corrosion fatigue failures but cannot prevent such failures. Something in addition is needed to stop the corrosion. However, the converse is also true: no amount of protection to the pipe to stop corrosion will stop fatigue failures if the pipe is overloaded. Good drilling practice must still be applied to obtain maximum life from the drill pipe. The pictures of the coated sample which failed in service by fatigue from the outside inward show this point very clearly. See Figures 5, 6 and 7. It is known that this pipe was from a string which was overloaded in service.

Returning again to the fatigue curves of Figure 1, the top full line curve shows the results of fatigue tests of sample bars grit blasted and coated with a thermo-setting phenolic base plastic, tested under highly corrosive conditions. The curve has flattened out giving a definite endur-

Figure 2 (Left)—Spotty corrosion pitting which has developed inside inside uncoated pipe. Almost every pit contains one or more corrosion fatigue cracks.

Figure 3 (Right)—Severe corrosion which sometimes develops inside drill pipe which has not been coated. Arrows point out some of the larger fatigue cracks which have originated at corrosion pits.

Figure 4—Enlarged close-up view of the inside surface of a corroded sample of drill pipe. Literally thousands of corrosion fatigue cracks have developed in this sample from the inside, yet none have developed from the outside.

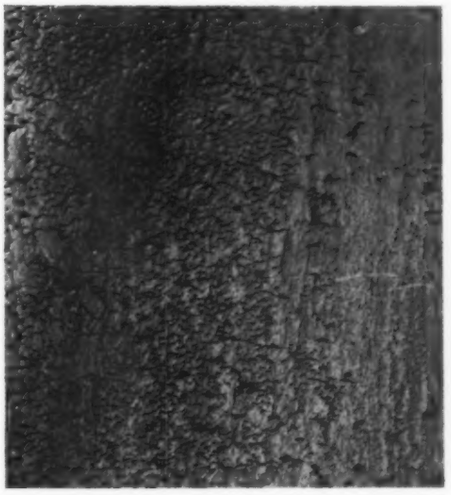


Figure 5—Section of sample of fractured plastic coated drill pipe after considerable service in the field. Coating still intact except where metal "stretched" at fracture.

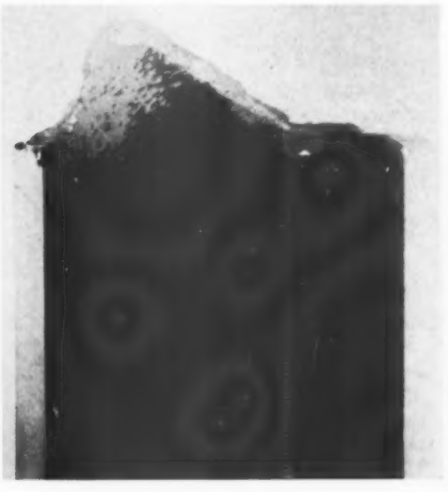
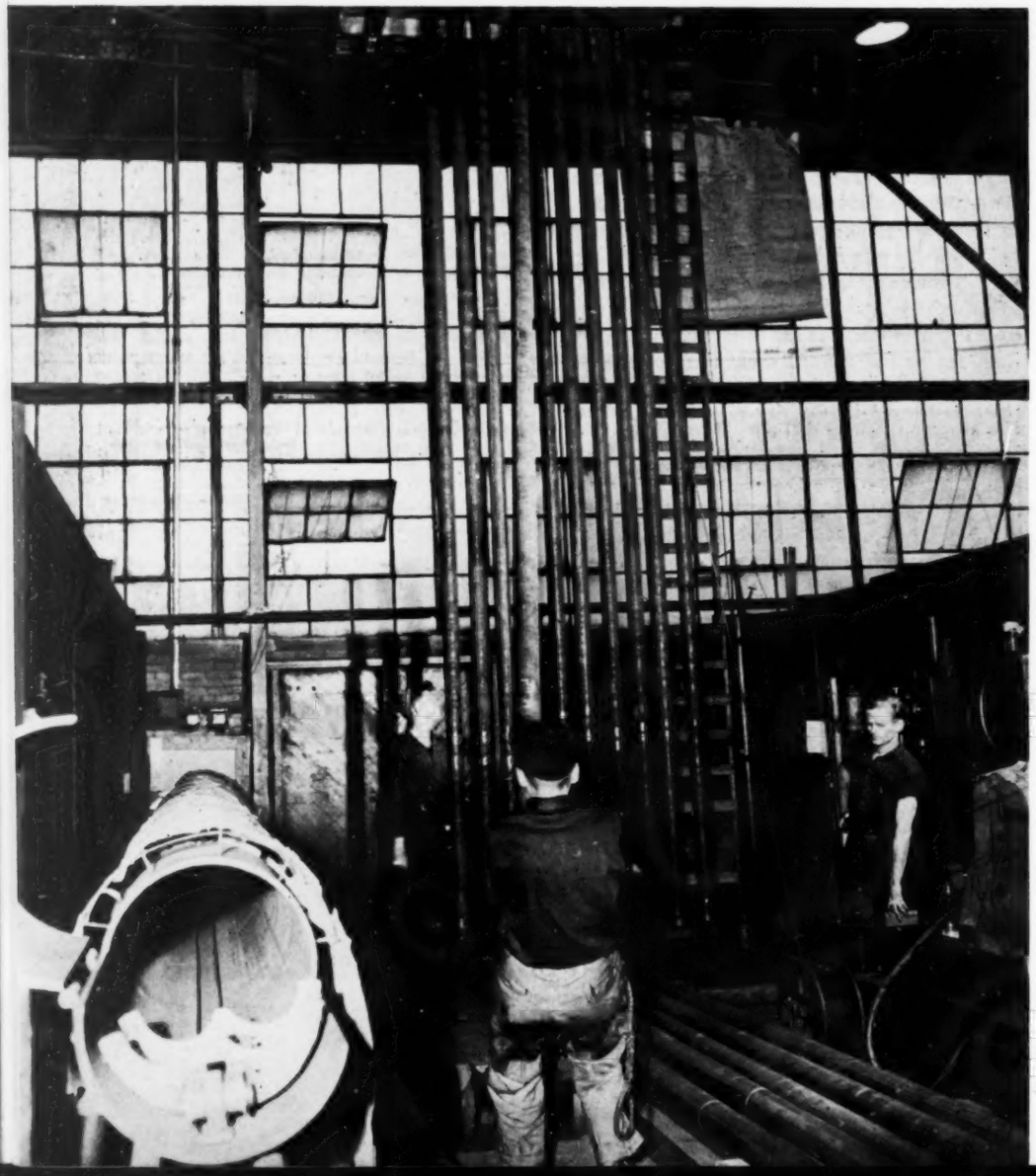


Figure 6—Same pipe section as shown in Fig. 5. Coating cleaned off with hot concentrated caustic solution to show that no corrosion or corrosion fatigue crackling developed at the inside surface.

Figure 7—Outside surface of section shown in Figs. 5 and 6. Sample failed by "pure" fatigue from outside inward.

Figure 8—Length of drill pipe being hoisted into coating r ack in preparation for filling with liquid plastic.



ance limit. This indicates that the bars were completely protected against corrosion and that failure was the result of "pure" fatigue. Grit blasting the surface under the coating was necessary to make it comparable to drill pipe which is cleaned of mill scale by grit blasting before coating. The steel used for the fatigue tests was not drill pipe steel but one which is comparable in strength values.

In 1942 two experimental strings of pipe were coated inside with air-drying plastic. The experimental strings for the most part were made up of alternate lengths of coated pipe, scale-free pipe, and pipe as mill processed with the mill scale remaining in the pipe. The scale from the coated pipe and the scale-free pipe was removed by grit blasting. Alternating lengths with the three different surfaces in each string permitted a good comparison.

A close check was made on these two strings by our field engineers. Samples were taken and shipped to our laboratory for examination from time to time. Out of twenty-one corrosion fatigue failures, only one was in a coated length and this length had become bent when a portion of the string had been dropped in the hole. Operation with this piece in the bent condition resulted in rapid failure. All other failures were in the uncoated pipe which had not been cleaned of mill scale. The uncoated samples, which were in the grit blasted condition only, became pitted and corrosion fatigue cracks began to develop in the pits. However, none had developed to the point of failure at the time the tests were concluded. The coating on the coated lengths did not stand up as well as expected. It had been removed in large patches, possibly by the combined abrasive and corrosive action of the mud, because the steel surface was found to be pitted and corroded. Up to this time, 25,000 feet of hole had been drilled with this coating in "corrosive" or "hot spot" areas. Apparently the coating, and even the removal of mill scale by grit blasting, had improved the drilling life of the pipe considerably.

As temporary expedient, grit blasting was recommended although the air-drying coating could not be recommended because it was felt that better protection could be found. From the poor showing of the air-drying plastic, work progressed to the baked-on type of coating such as the thermo-setting phenolic which at present appears to give very satisfactory results. Consequently four strings of drill pipe were prepared for field test with this coating.

The coating is applied only to the inside of the pipe with four individual coats, all bonded together and bonded to the grit-blasted steel surface by baking. Figure 8 is a photograph of a pilot plant installed in the Research Laboratory for applying the coating inside the pipe. In this photograph a length of pipe is being raised to the coating rack where the liquid plastic is pumped into the pipe to fill it completely. It is then

Figure 9—Operator carefully watches gauge so as to control draining rate of plastic-filled pipe.

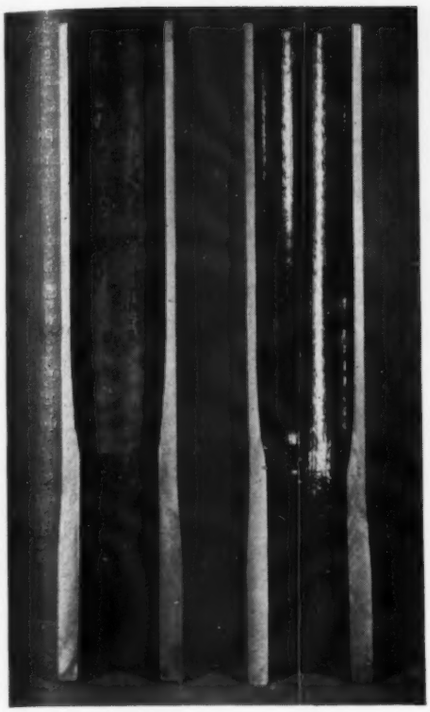


Figure 11—Left: Section of new pipe with mill scale on inside surface. Right: Secton of new pipe after plastic coating. (Scale removed before coating by grit blasting.)

drained at a definite rate so as to give a continuous coating of uniform thickness free of runs. Figure 9 shows an operator carefully watching a manometer gauge so as to adjust the draining rate. Between each coat the pipe is given a preliminary baking. In Figure 10, three lengths are being slid into the long baking oven. This process is repeated after each coat until the final coat when the pipe is baked at a higher temperature to bond all coats together and produce maximum chemical resistance.

The mill production equipment for coating drill pipe is arranged in a similar way except on a larger scale. The appearance of the coating as produced is shown at the right of Figure 11. At the left for comparison is an uncoated sample containing mill scale. The coating is smooth, hard and chip resistant. It is flexible enough to be bent around a 5" diameter mandrel when coated on sheet metal. The color is the typical deep maroon color of unpigmented phenolic plastic.

To date the four strings experimentally coated with the baked-on phenolic plastic have drilled over 62,000 feet of hole without a corrosion fatigue failure in the coated lengths. Fourteen corrosion fatigue failures occurred in the uncoated comparison lengths and three "pure" fatigue failures occurred in the coated lengths. The three failures in the coated lengths originated and developed from the outside surfaces from causes other than corrosion fatigue. One of these samples is shown in Figures 5, 6 and 7. The coating is still in good condition and the steel surface under the coating is free of corrosion, pits, or corrosion fatigue cracks, even after a long period of service. The sample failed by fatigue from the outside inward. It is known that the string from which this sample was taken had had hard service.

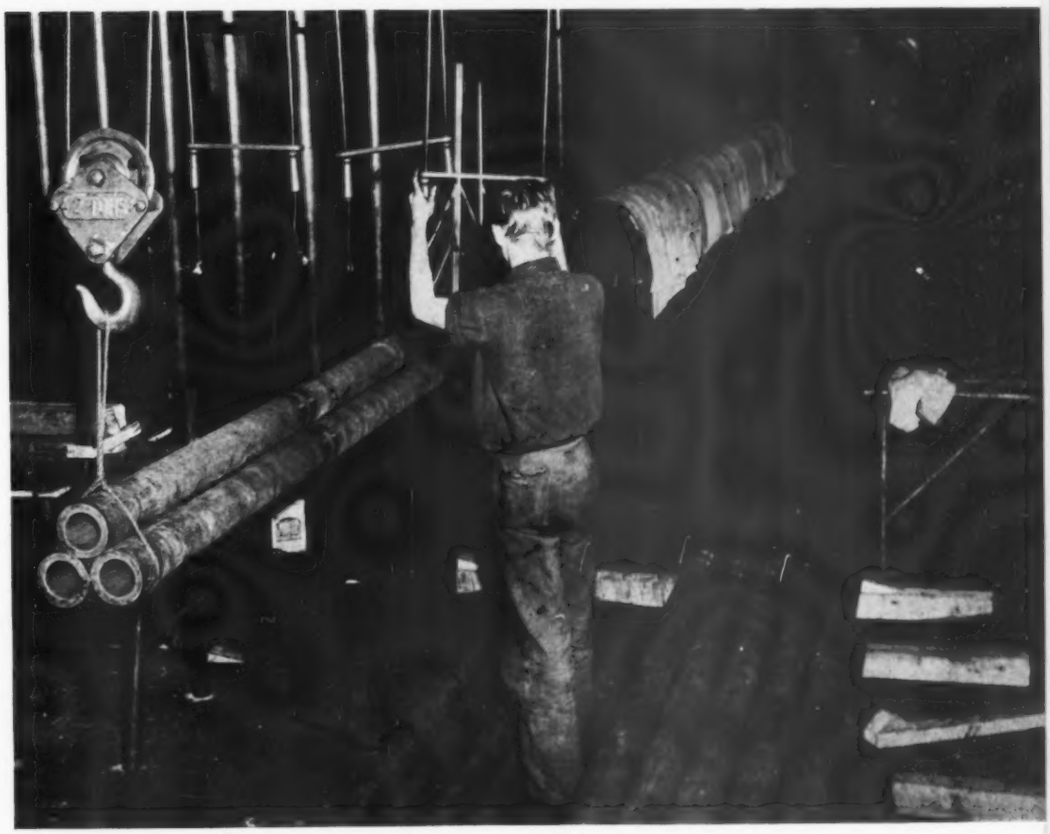


Figure 10—Three lengths of coated pipe going into the tubular baking oven.

From the experimental field trials and from the laboratory fatigue tests, it can be stated that the thermo-setting phenolic plastic coating definitely adds much to the life of drill pipe. The laboratory fatigue tests show that a definite endurance limit can be obtained when tests are made under corrosive conditions when the surface of the steel is protected with the coating. To date, it appears that the coating of drill pipe with this plastic has greatly contributed to the solution of this troublesome problem of corrosion fatigue failures.

Rawleigh Warner | L. S. Wescoat | Henry M. Dawes

PURE OIL MAKES MANAGEMENT CHANGES

L. S. WESCOAT who has been a vice president of Pure Oil Company for the past twenty years has been elected president. He succeeds Henry M. Dawes who has occupied the presidential chair since 1924 and who now becomes chairman of the newly-established executive committee. Other members of the committee are R. W. McIlvain, vice chairman, Beman G. Dawes, Rawleigh Warner, L. S. Wescoat and C. B. Watson. Rawleigh Warner is chairman of the board.

Other officers elected are as follows: Comer Plummer, vice president for production; J. P. Langfitt, vice president for refining; D. D. Irwin, vice president for transportation and supply; R. H. McElroy, vice president for marketing; C. W. Snider, assistant vice president for marketing; Curtis Dawes, assistant vice president for southern marketing operations; G. W. Sanders, assistant vice president for wholesale marketing; R. W. McIlvain, Jr., assistant vice president for production; W. V. Keeley, assistant vice president for insurance and taxes; J. W. Rees, assistant vice president for personnel; W. J. Arnold, assistant vice president for accounting; R. L. Milligan, treasurer; C. H. Jay, secretary; J. H. Botkin, comptroller; Harry L. Wylie, assistant treasurer.

Henry M. Dawes became president of Pure Oil Company in 1924, succeeding his brother, Beman G. Dawes, who had headed the company during its formative period. He was born in Marietta, Ohio, and was one of four brothers, all of whom attained distinction. He graduated from Marietta College and within a few years thereafter became president of Southern Petroleum Company. Subsequently for several years he engaged in the public utility business in Chicago. In 1923 he was appointed Comptroller of Currency of the United States and a member of the Federal Reserve Board. He left that post to accept the presidency of Pure Oil. Under his direction its operations have been greatly expanded, and it has developed into a fully integrated company.

L. S. Wescoat, the newly-elected president, comes to top rank in the company after twenty-two years in its service, preceded by experience in the automotive and public utility fields. The first ten years of his business career were spent in the organization and administration of enterprises controlled by a group of Philadelphia bankers. He served in World War I and at its conclusion joined the Fisher Body Company in Detroit. In 1922 he became vice president and general manager of Southwestern Gas and Electric Company, an operator of public utilities and a producer of natural gas and oil, with headquarters at Shreveport, Louisiana. Upon joining Pure Oil Company in 1925 at Columbus, Ohio, he first served as general sales manager, was elected vice president in 1927, vice president and secretary in 1932 and has been a director since 1936. Mr. Wescoat is active in industry association affairs. He is treasurer and a director of the American Petroleum Institute and is chairman of the Institute's Committee on Highways. He is a director of the Automotive Safety Foundation and the National Highway Users' Conference.

Rawleigh Warner, now chairman of the board, is a native of Chicago and a graduate of Lawrenceville School and Princeton University. Following army service in the first World War, he became connected with Dawes Bros. Inc. of Chicago where he served as director, vice president and treasurer of that corporation. His association with Pure Oil began in 1926 as vice president and treasurer, and he has been a director since 1927.

Robert W. McIlvain, Sr., vice chairman of the executive committee, has been a vice president of the company in charge of production for the past thirty-four years. He was born at Cassopolis, Michigan, and became a rancher and later a miner at Cripple Creek, Colorado, before entering the oil business in Louisiana and Arkansas in 1908. In 1914 he joined the Ohio Cities Gas Company, a predecessor of Pure Oil Company, and was located at Charleston and Cabin Creek, West Virginia.

Of the other members of the executive committee, Beman G. Dawes has been actively identified with the Pure Oil Company and its predecessors for thirty-four years. Born and educated at Marietta, Ohio, he engaged in engineering work in the west and southwest, and in that way became interested in the management of public utliities. In 1913 he became president of the Columbus Gas and Fuel Company, and when it was merged in Pure Oil Company, he held the same position in the latter until succeeded by his brother when he became chairman of the board. He resides in Columbus and Newark, Ohio. He represented the 15th Ohio district in Congress from 1905 to 1909.

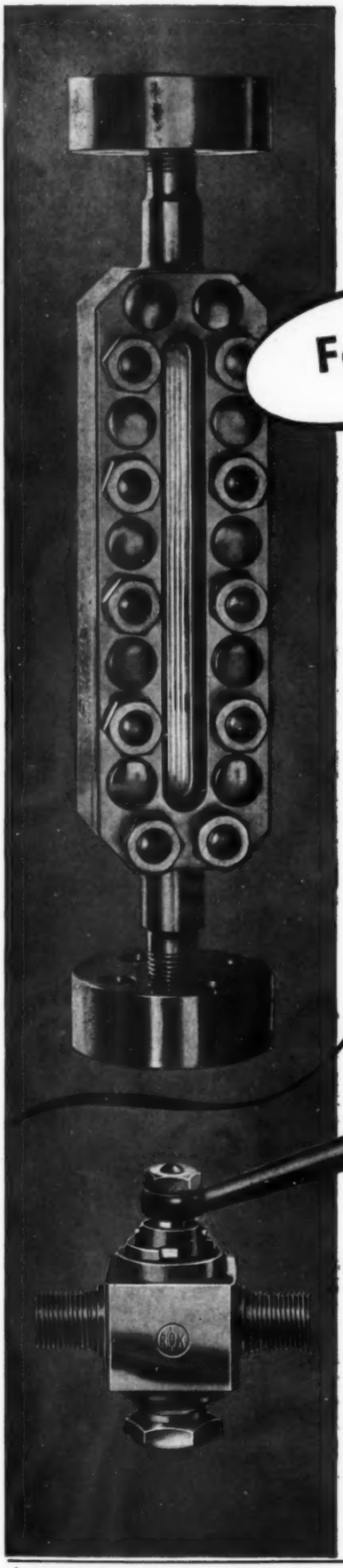
Cornelius B. Watson, another executive committeeman, first served Pure Oil as consulting engineer and he later built several of the company's refineries. He has been a director since 1931 and has served as vice president in charge of refining, transportation and marketing.

Comer Plummer, vice president in charge of production, was admitted to the Texas bar following service in the U. S. Navy in World War I. He has been with the Pure Oil Company or predecessor companies since 1922 and was manager of the company's southwestern producing division with headquarters at Tulsa for several years before coming to Chicago as assistant general manager of production.

David D. Irwin, vice president in charge of transportation, has been with the company for 14 years, following geological and mining work. He is president of Pure Transportation Company, a member of the transportation committee of the American Petroleum Institute and of the pipe line committee of the recently formed National Petroleum Council.

J. Porter Langfitt, vice president in charge of refining, came directly to Pure from college in 1925 and entered the Marcus Hook, Pa., refinery where he worked on the stills. For the next twelve years he spent the greater part of his time in the company's refineries in distillation and processing work. In 1937 he was appointed to the post of assistant to the vice president in charge of refining with headquarters in Chicago.

Robert H. McElroy, newly elected vice president in charge of marketing, is another native of Chicago. He has spent his working life in the petroleum industry, with 22 years of that time in sales work with Pure Oil Company. Before being appointed to his present post, he was assistant to the vice president for marketing.



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CONCERN OVER SUPPLY SUPPORTS PLEA FOR OGD PRESERVATION

By William J. Maddox

Washington

IN former years when Jed Johnson, then Representative from Oklahoma and chairman of the subcommittee of the House appropriation committee, was feuding with Harold Ickes, it became a yearly routine for the House to slash ruthlessly the appropriation asked for the Interior Department. Then the Senate would restore the amounts lopped off in the House, or mainly so, and Secretary Ickes would get a major share of what he had demanded in the first place. This year, with both Johnson and Ickes on the sidelines, the act is being repeated, and among the victims of the committee's knife is the Oil and Gas Division and, incident thereto, the National Petroleum Council.

This year, however, things look a bit desperate for OGD and the old routine may not work out to the same happy ending for Interior. Congress is determined to make a showing in reducing government expenses and is resisting stiffly efforts to nullify its cuts. Observers at the Capitol feel, nevertheless, that the Senate will restore at least enough of the $463,900 allowed OGD by the Bureau of the Budget for the coming fiscal year to enable the new division to continue functioning. But the question naturally is asked, suppose it doesn't? What becomes of OGD and NPC? That will be up to Secretary of Interior Krug, with possibly President Truman entering the picture. Both men are thoroughly sold on the government-industry cooperative set-up, and while no one in authority is crossing the bridge prematurely, it's safe to assume that every expedient will be explored in the effort to find a source of funds somewhere.

When the bill went to the Senate sub-committee handling the Interior appropriation, Walter S. Hallanan, president of Plymouth Oil and chairman of NPC, made an able argument for government-industry cooperation. With demands for oil and petroleum products far exceeding the wartime peak and discoveries of new fields declining, he told the Senators, "We must recognize that a serious situation is faced by the industry in meeting essential supply problems." He named no specific amount that should be given OGD but urged that sufficient funds be provided to permit it to "function as a government agency in coordination with the oil and gas industry as represented by the National Petroleum Council."

Gordon Duke, president of Southeastern Oil, Inc., and chairman of the executive committee of the National Council of Independent Petroleum Associations, told the committee: "It would be unfair to let stand an impression that government is footing the bill for an oil trade association."

He said the independent oil marketers are as anxious as everyone else to cut non-essential government expenses, "but we do not believe that OGD should be reduced to such a point that it would be eliminated because we feel that the investment in OGD will yield to the American public a substantial return on every dollar spent."

Meantime OGD is trimming its staff. Fifteen war service employees have been given 30-day termination notices effective May 31, and 17 field employees with Civil Service status were furloughed during May without pay to keep within limitations of the current and 1948 budgets. A skeleton staff of 16, according to Director Max Ball, will remain through the current fiscal year to carry on as many functions of the Washington office as can be maintained within available funds.

Ball also let it be known that activities will be maintained for the balance of the fiscal year with NPC and with the Interdepartmental Petroleum Committee, members of which represent federal agencies working on oil and gas matters.

According to the OGD Director, the House budget cuts would result in further reducing the Washington and field staffs on July 1 and limiting its activities to enforcement of the Connally "Hot Oil" Act and the liquidation of PAW. Without funds to continue division activities other than these, both NPC and the Interdepartmental Petroleum Committee will have to be liquidated and their studies pertaining to oil and gas eliminated June 30. The Council's operating committees that will be abolished are: materials requirements by the oil and gas industry; military aircraft fuels productive capacity sub-committee on jet engine fuels specifications; international standards for measurement of liquid petroleum fuels; crude and products availability; crude and products transportation facilities; petroleum refinery capacity; steel and equipment shortages, and military and civilian agency requirements.

Real concern is felt here by industry and government men over the ability to meet military, industrial and individual requirements for petroleum products during the coming fall and winter. Demands are running much higher than was anticipated and shortages of gasoline and fuel oil are now predicted. Spot shortages have already appeared in natural gas, liquefied petroleum gas, domestic heating oils, diesel fuel, industrial fuel oil and even tractor fuel.

At NPC's April meeting, OGD presented a broad view of the supply situation as seen by the Army-Navy Petroleum Board, the Bureau of Federal Supply, the Maritime Commission, the Federal Power Commission and the Office of Defense Transportation, as well as reports on current conditions in specific localities by members of the Council. At the request of OGD, the Council voted to create four more committees to assemble facts for the division. It was also decided to re-activate the former committee on materials for the industry and to create a committee to advise on obtaining military and civilian government oil.

According to the ANPB, invitations to bid for military supplies of petroleum products are going begging. If a more productive response is not forthcoming, part of the fleet might have to be tied up and the occupation forces might be hampered, the military say. The Federal Supply Bureau, which procures for the civilian government establishments say they can cover only 10 percent of their requirements in the northern central states.

"Today's consumption of petroleum products in the United States," comments NPC Chairman Hallanan, "is equal to that of the entire world before the war. We are using oil and gas faster than in the peak year of the war, and the rate of consumption continues to rise. Demand in 1946 for all products, including refined products exported, was 5,321,000 barrels per day. This was the highest in our history, but the Economics Advisory Committee of the Interstate Oil Compact Commission estimates the average for 1947 will be 5,700,000 and that in the last quarter of 1947 it will be 5,900,000.

"The sources of this huge and increasing demand are not far to seek. There were 475,000 new oil burners installed in 1946, not counting replacements. Present oil-burner sales are running close to 50,000 per month. It is expected that 3,421,000 will be in use by the end of the year. New cars, trucks and buses, new diesel locomotives and new farm machinery are pouring out of the factory in increasing volume. Already there are more trucks on the road than there were before we entered the war—5,423,000 in 1946 against 4,859,000 in 1941. As we replace the losses in our automobiles—there were only 27,088,000 in 1946 as against 29,524,000 in 1941—there will be a further stimulation to demand for gasoline and lubricants."

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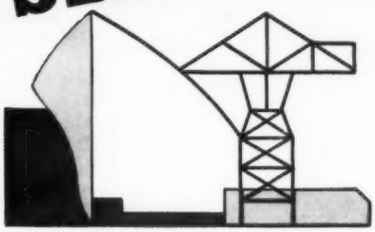
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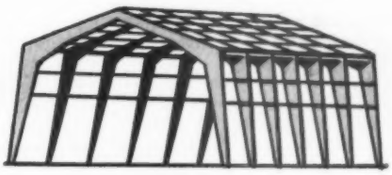

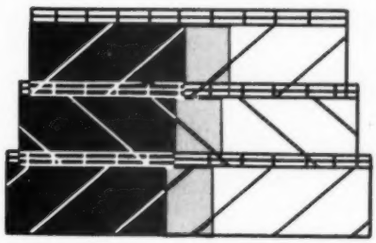
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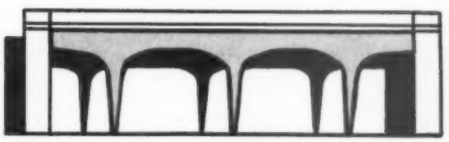

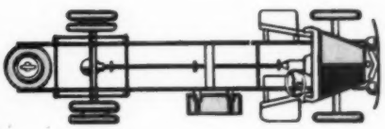
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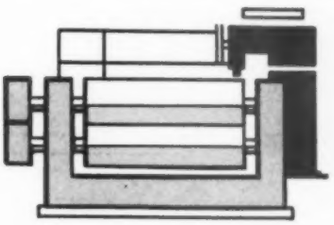

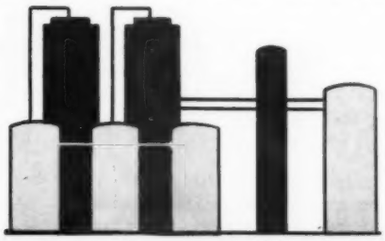
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International News and Notes

Jhr. Dr. John Hugo Loudon

JHR. DR. JOHN HUGO LOUDON, who has recently been appointed a managing director of the Royal Dutch and of De Bataafsche Petroleum Maatschappij, has served the Shell group of companies in the United States and in Latin America for many years. He completed his studies at Utrecht University, where he graduated as Doctor of Law in 1929, and in April of the following year he joined the B.P.M. at The Hague. In November, 1930 he went to Venezuela as a group trainee and remained there until the end of 1931, when he returned to The Hague. In January, 1932, he went to the United States where he served in various capacities including assistant to the vice president of Shell Oil Company, San Francisco.

In October, 1937, he was asked to take the position of an assistant manager in Caracas, where he worked first with W. T. S. Doyle and later with B. Th. W. van Hasselt. Upon Mr. van Hasselt's appointment as a director in July, 1944, he became general manager in Venezuela.

Daniels Made Pantepec President

C. U. Daniels recently elected president of Pantepec Oil Company of Venezuela, C.A., has spent his entire business career in the petroleum industry. His experience, extending over a period of 34 years, has covered practically every phase of the industry. In advancing to the top executive position in Pantepec, Mr. Daniels moved up from the general managership, a post he accepted last October after resigning as vice president of Oklahoma Natural Gas Co. As Pantepec president, he succeeds Warren W. Smith, retired after 23 years with the company. Mr. Smith had been president since 1943.

Colombian Law Revision

At the session of the Colombian Congress which meets in July, the government will make a serious effort to bring about revision of the present petroleum law, a proposal that has been under discussion for the past several years. It is expected that a bill approved by the recently established National Petroleum Council will be submitted by the Minister of Petroleum with strong recommendation for its adoption.

Under the present law protracted delays in passing upon applications for concessions have hampered development of the country's oil resources. During 1946 only seven applications received final favorable action. A large number of petitions, some of which have been on file for a number of years, are still pending. In addition to requests from companies now operating in Colombia, there are a number from others without present holdings that are anxious to undertake exploration. Among these are at least four large North American groups, and it is recognized that it would be helpful to the progress of the Colombian oil industry if their active participation in exploration and development could be had.

Italy's Oil Needs

Italy's requirements of petroleum products for 1947 are estimated by the government's petroleum office at 2,770,000 metric tons. It is proposed to meet part of this demand by importation of 1,300,000 tons of crude for processing in Italian refineries and the remainder by imports of products. In the estimate of consumption, the largest single item is heavy fuel oil, 1,700,000 tons. Motor gasoline, including aviation, is calculated at 435,000 tons, kerosene, 170,000, and distillate fuel oil, 140,000 tons.

Australia's Imports

Imports of petroleum into Australia during 1946 amounted to 23,602,352 barrels as follows:

Product	Barrels
Crude	1,110,322
Gasoline	10,503,972
Kerosene	2,585,422
Residual fuel oil	7,911,410
Lubricants	578,324
Other	912,902

Chief source of supply was the Middle East with 18,728,627 barrels, followed by the United States, 3,274,466 barrels, and Netherlands India, 1,143,144 barrels.

Austrian Industry Disorganized

Economic life in Austria is completely disorganized, reports an Austrian correspondent. Political uncertainty paralyzes all initiative. It is not even possible to obtain accurate information concerning current activities due to the fact that a large part of the country lies behind the "Iron Curtain," and there is no knowledge of the extent to which the nation will be stripped of the capital resources essential to the resumption of industrial life.

Hope of stability rests upon the peace treaty, and there is sharp disappointment that the Allied powers have not come to agreement on its terms. Questions that remain unanswered are whether Austria will become a really free country, what is to be done with property taken over by the Nazis through force or fraud, what measures can be taken to stabilize the currency.

In the petroleum industry conditions are much the same as in others with a scarcity of supplies and distribution impeded by lack of trucks and the uncertain operation of railways, often interrupted by lack of fuel. Purchasers who have the means and whose necessities require petroleum products can obtain these in limited quantity from the black market but must pay exorbitantly and make their own deliveries.

Despite wasteful production practices under Nazi control, it is not true as has been reported that the country's oil resources have been seriously depleted. From the fields of the Zisterdorf region which were estimated to contain 250-300 million barrels, not more than 40 million has been withdrawn up to 1945. The peak of production, reached in 1942, was about 12 million barrels. In the later war years, this was reduced by Allied bombing, and in 1945 it was reportedly 8,500,000 barrels. No dependable figures of current output are obtainable, but unofficial estimates place the 1946 production at approximately 4,000,000 barrels.

Dictionary of Foreign Trade

Every trade has its own professional language which contains words and expressions that are Greek to outsiders and novices. This is especially true of foreign trade, wherein the traders have to become familiar with an enormous number of terms, phrases and their abbreviations. How rich is the vocabulary of foreign trade will be attested by the very bulk of the Dictionary of Foreign Trade (second edition) by Frank Henius (Prentice-Hall, Inc., New York, $12.50) which was published on May 1, 1947. The information provided by Mr. Henius covers 959 pages and contains more than 6,000 principal entries arranged in alphabetical order and which evidently cover practically every detail of international trade practices and procedures in buying, selling, importing, exporting, finance, chartering, etc. There is a table of some 3,000 trade abbreviations used in English, French, Spanish and German and a very detailed section on weights and measures in Anglo-American and metric units. Particularly noteworthy is a collection of nearly 300 facsimile copies of documents required for international business transactions and legal formalities.

Peruvian Petroleum Corporation

Organization of a petroleum corporation under the above name has been authorized by the Peruvian Congress. The company will be controlled by the government which will hold 75 percent of its shares, the remainder to be subscribed by Peruvian nationals. The company will have authority to engage in all phases of petroleum activity including exploration, drilling, transportation, refining and marketing. It can be liquidated only by action of the Congress.

PRODUCTION of crude oil in Iran during 1946, according to provision figures reported by Anglo-Iranian Oil Company, Ltd., was 19,200,000 tons or approximately 139,200,000 barrels. Production for the month of January 1947 was 1,640,000 tons or 11,890,000 barrels.

Venezuelan Production

Production of crude oil in Venezuela during the month of March amounted to 35,978,435 barrels, an average of 1,160,595 barrels daily. As compared with February, this daily average is lower by 7,981 barrels. Exports for the month were 32,384,329 barrels. Production by companies is shown in the following table:

Company	West	East	Total
Creole	13,709,425	4,721,454	18,430,879
Mene Grande	1,722,891	4,532,628	6,305,519
Shell	9,474,584	—	9,474,584
Consolidada	—	692,650	692,650
Socony	—	806,069	806,069
Texas	—	216,389	216,389
B.C.O.	31,616	—	31,616
Orinoco	7,869	—	7,869
Guasare	.....	—	.....
Phillips	—	4,673	4,673
S.A.P. Las Mercedes	—	6,883	6,883
Atlantic	—	1,304	1,304
Totals—Bbls.	24,996,385	10,982,050	35,978,435
Exports—Bbls.			32,384,329

J. R. WARFORD, formerly managing director of two foreign marketing subsidiaries of Sun Oil Co., now heads a newly created wax section in the company's industrial products department in the United States. George W. Mock, technical representative for war products, will be associated with Mr. Warford.

Mr. Warford was until recently managing director of British Sun Oil Co., Ltd., London, Netherlands Sun Oil Co., Rotterdam, and its subsidiary, Belgium Sun Oil Co., Antwerp. He first started with the parent Sun Oil in the production department at Dallas, Texas, in 1920. Subsequently he served in the accounting and sales departments and first went to London in 1932.

During the recent war he held the rank of lieutenant colonel in the army and directed the distribution of petroleum products in the European battle sector. Mr. Warford returned to foreign operations with offices in London in October, 1945, following his release from military duty, and came back to the United States in January, 1947.

George W. Mock, associated with Mr. Warford in the new department as technical representative for wax products, joined Sun Oil Company in 1937. He was employed in the electrical department at Marcus Hook, Pa., refinery until 1944 when he went to Washington to serve with the Petroleum Administration for War in the allocation of electrical equipment in the petroleum industry. He transferred to the purchasing department in Philadelphia as an assistant buyer following his return from PAW service in 1945. Later that year he was appointed to his present position as technical representative for wax products in the industrial products department.

S & L at British Fair

Stewarts and Lloyds, Limited and its subsidiary companies exhibited a wide range of products at the British Industries Fair at Birmingham in May. After six years of war, during which the activities of the company were largely directed towards the output of weapons and other equipment for the services, the emphasis is once again on peacetime needs and developments, and the exhibits (housed on four main stands) gave the visitor to the Fair an indication of what the company has to offer to the world-wide task of reconstruction in the immediate postwar years. Included were steel tubes, valves and fittings, joints and couplings and iron and steel castings.

Engineering and Marine Exhibition

The Engineering and Marine Exhibition which opens at Olympia, London, on August 28 to September 13 will present at least one interesting refutation of the carefully circulated story that British industry—tied by crippling controls, shortages of raw material, man power and fuel—has neither the resilience nor the initiative to weather the international marketing storms.

This year's exhibition embraces the whole of the main hall and national halls at Olympia together with their galleries, an increase of over 45 percent on the 1937 exhibition. Every available square foot of this space is taken; mostly by firms who for years have been regular supporters of this leading British exhibition. Also represented are many newer industries whose advent is an index of the vast war-induced subdivision and specialization in the trades ancillary to shipping and engineering.

C. C. Wakefield Appointment

Sir Maurice Batho has been appointed C. C. Wakefield & Company Limited's export promotion manager. He has been connected with Wakefield's overseas organization since 1929 and was manager of the company's Ceylon branch until 1937. During the war, after service in the first Burma campaign, he was attached to the Shear's Mission and later was deputy director for rice procurement to the Government of Bengal with the rank of lieutenant colonel.

Iraq To Build Refinery

The government of Iraq has invited bids on the construction of a refinery to be built at Baiji to supply the local Iraqui market. Bidding on equipment and erection of the plant will be closed on Nov. 26, 1947. The proposed plant will have a crude capacity of about 12,000 barrels per day. Crude will be supplied by Iraq Petroleum Co. from the Kirkuk field.

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OIL COMPANY STAFF CHANGES

Carl S. Miner

CARL S. MINER, head of the Miner Laboratories, Chicago, has been elected a director of Universal Oil Products Company. Mr. Miner graduated in 1903 from the University of Chicago with a B.S. degree in chemistry. Immediately afterwards, he served as a research chemist for Corn Products Refining Co. In 1906 he resigned to establish the Miner Laboratories.

Mr. Miner is credited with many scientific achievements during his long association with the chemical profession. In 1940 he was the recipient of a Modern Pioneer Award from the National Association of Manufacturers. During the war, he was a consultant of the Rubber Survey Committee and a member of the Chemical Referee Board, Office of Production Research and Development, War Production Board.

R. L. WAGNER has been appointed assistant manager of the legal department, Shell Oil Co., Inc., New York. Mr. Wagner began his career with Shell in 1939 as an attorney in the company's St. Louis, Mo., office. Three years later he entered the U. S. Navy on military leave of absence, serving on an escort carrier in the Pacific and attaining the rank of lieutenant commander. He returned to Shell in 1946.

PITTSBURGH CONSOLIDATED COAL CO. has appointed Dr. Howard S. Turner of Swarthmore, Pa., as assistant director of the research and development division at Library, Pa. Dr. Turner resigned from the duPont Company where he had been employed for 11 years in research and development work. In cooperation with Standard Oil Co. (N. J.), the company is building a pilot plant for coal gasification at Library.

O. D. STORY has been placed in charge of Shell Oil Company's purchasing-stores functions for exploration and production activities in its East-of-the-Rockies territory. H. A. Shanks will head the purchasing-stores division in Midland, Texas; A. J. Clark in New Orleans; C. G. McLaren in Tulsa; and E. J. Ehinger in Houston. Mr. Story, who has been with Shell twenty-five years, is past president of the Houston Purchasing Agents' Association; immediate past vice president and member of the executive committee of the National Association of Purchasing Agents; and at present national vice chairman of the Oil Company Buyers' Group.

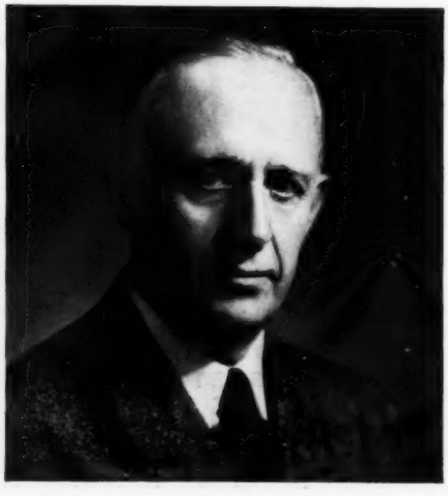
W. A. Eardley

W. A. EARDLEY has been appointed chief petroleum engineer in the Standard Oil Co. of California's producing department. He succeeds E. G. Gaylord who recently was elected a vice president and director of California Research Corp. Mr. Eardley joined Standard in 1926 upon graduation from Stanford University. In 1943 he was named supervising petroleum engineer at the San Francisco offices.

J. G. TOLPIN, formerly with Universal Oil Products Co. has been appointed to the new position of editor of foreign technical information in the development and patent department of Standard Oil Co. (Indiana). He will study foreign scientific and technical publications and report on matters of interest to the company in connection with its expanded development and research program.

From 1937 until recently Mr. Tolpin was editor of the Survey of Foreign Petroleum Literature, a weekly service which reviewed for 15 oil and chemical companies in the United States the progress of Russian research in oil refining and chemistry. He designed and teaches courses of Russian for scientists at Northwestern University and is a visiting lecturer in scientific Russian at the University of Chicago.

J. G. Tolpin



DRILLING SPECIALTIES CO., Bartlesville, Okla., has been organized as a subsidiary of Phillips Petroleum Co. to handle sales, licensing and service of Driscose a new drilling fluid. George R. Benz, manager of Phillips' chemical products department, is president of the new company. Directors include Mr. Benz, H. H. Kaveler and S. S. Learned. Others officers are C. C. Crawford and J. J. Pettigrove, vice presidents; B. F. Stradley, secretary treasurer; T. V. Stevens, assistant treasurer, and R. E. Arnold, assistant secretary.

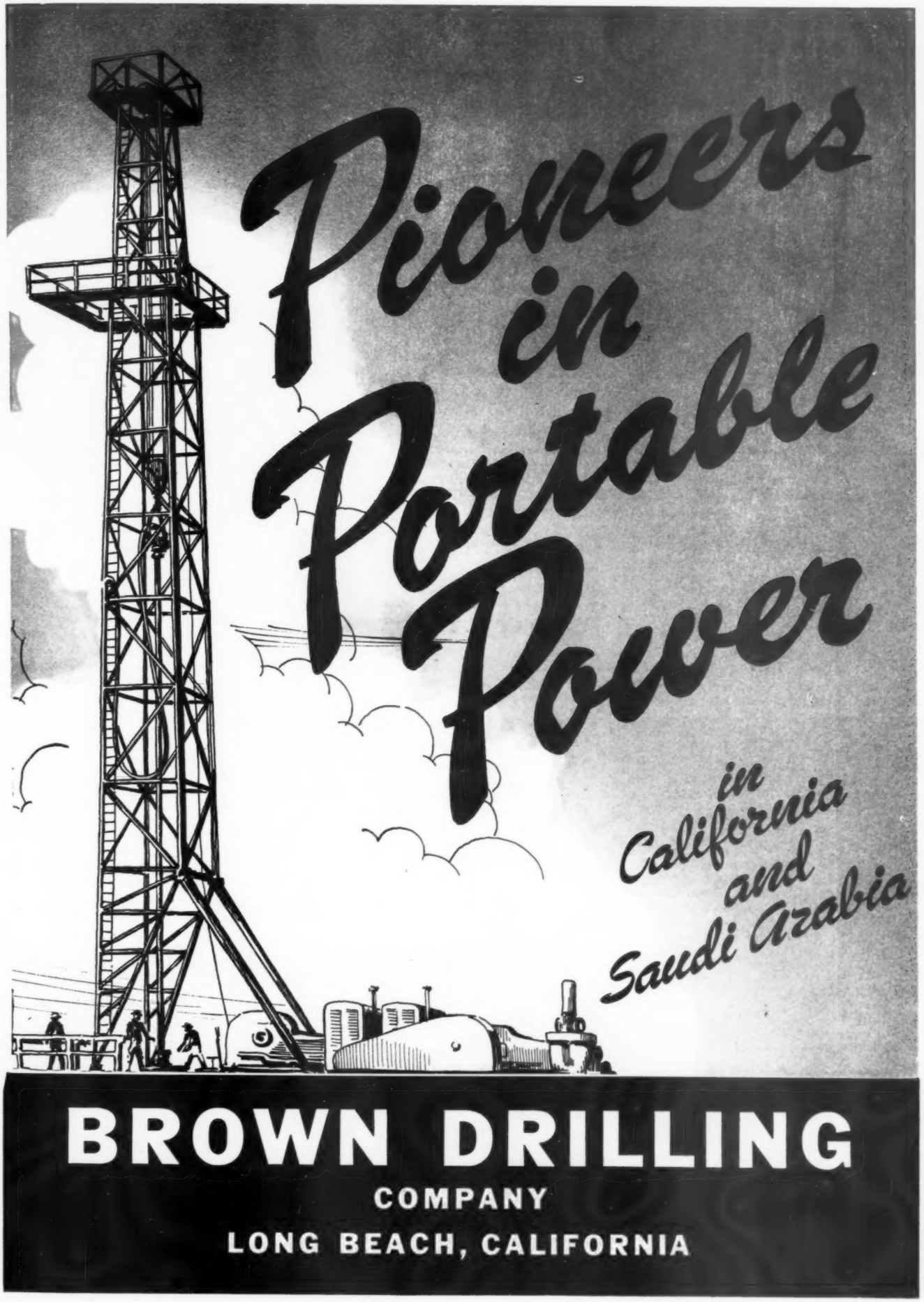
EDWARD S. BUDD has been appointed engine and compressor parts division manager of The Cooper-Bessemer Corp. Like many engine manufacturers, Cooper-Bessemer devoted the major portion of its production efforts to the Armed Services and to critical industries during the recent war, with the result that replacement parts for the thousands of gas engines diesels and compressors now in industrial usage are still acutely scarce. This year's volume of spare parts is expected to account for nearly one-fifth of the company's total sales. In this new post, Mr. Budd will be responsible for the establishment of credit policy, the organization of a standardized merchandising program and delivery schedules of the parts department.

KERN OIL COMPANY LIMITED of London has announced the appointmet of Fred M. Ziegler as managing director of its British West Indies subsidiary, Kern Trinidad Oilfields, Limited. Mr. Ziegler has long been associated with the California company of Kern Oil Company Limited, and his new duties will call for a division of his time between Trinidad and California.

DR. PAUL H. CARNELL has resigned his position in the research department of Phillips Petroleum Co., Bartlesville, Okla. He is now in charge of research and development at Leonard Refineries, Inc., Alma, Mich.

GAYNOR H. LANGSDORF has been elected vice president and director of Oronite Chemical Company, in charge of products and processes. He has been manager of technical services in the manufacturing department of the Standard Oil Co. of California. In his new position, he will be responsible for activities relating to manufacturing, research and product development. He also will act in a liaison capacity in these matters with Standard and its research subsidiary, California Research Corp.

Gaynor H. Langsdorf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E. G. Gaylord

CALIFORNIA RESEARCH CORP., Standard of California subsidiary, has formed a new division to coordinate and expand the company's oil field research activities. Heading the division is E. G. Gaylord, who has been elected vice president and director of the research company. Activities of the new branch will embrace laboratory and research services for the various oil field operations of Standard, its subsidiaries and affiliates, including geological, geophysical, drilling, producing and surface processing work. Laboratories for this work will be at La Habra, Calif., where a new structure is now under construction.

Mr. Gaylord's experience and background fit in particularly with his new position. A 1911 graduate of the University of California, he started in the oil business as a roustabout during his college vacations. After ten years in the engineering and geology departments of Pacific Oil Company, he was placed in charge of development in 1921. Gaylord joined Standard in 1926 at the time of its merger with Pacific Oil. He became chief petroleum engineer, holding that position until his recent appointment. He now serves as chairman of production research committee of American Petroleum Institute.

ANGUS P. McEACHERN has been appointed chairman of the California management committee of Kern Oil Company, Ltd. He succeeds Roscoe W. Stephens. McEachern, a member of the California bar, is California counsel and assistant secretary of the company.

R. Joe Stephens has been appointed a member of the California management committee. Stephens will continue as Kern's general superintendent in which capacity he has served for some years past.

JAMES M. BARKER has been elected a director of Universal Oil Products Company, Chicago. Mr. Barker is now a director of Sears Roebuck & Co., is chairman of the Allstate insurance companies and a director and voting trustee of the Chicago, Milwaukee, St. Paul and Pacific Railroad, and a director of Harris Trust & Savings Bank, Chicago. He is trustee of Northwestern University, a trustee of the America School of Prehistoric Research and a life member, corporation, Massachusetts Institute of Technology.

TRANSAMERICAN FACTORS LTD. has moved its U. S. offices to the Walter P. Story Bldg., 610 So. Broadway, Los Angeles 14. Victor E. Milch is resident partner in charge of these offices.

William K. Warren

THE HANLON AWARD for outstanding service to the natural gasoline industry was presented to William K. Warren, president of Warren Petroleum Corp., Tulsa, at the recent annual meeting of the Natural Gasoline Association of America. It was given in recognition of Mr. Warren's work in developing wider markets for natural gasoline. Previously the committee has named outstanding technologists for their part in developing new processes of manufacture or testing methods. In addition to his activity in promoting sales of volatile blending fluids to refiners, Mr. Warren has been an ardent advocate of the building of adequate storage to compensate for the wide seasonal variation in demand. Recipients of the award receive a fine watch in addition to the plaque donated by Ed Hanlon, pioneer gasoline manufacturer and Tulsa banker.

Peavy Heads Houdry Engineering

Dr. Claude C. Peavy has been appointed chief engineer of Houdry Process Corp. He has been chief of the process design division. Dr. Peavy came to Houdry a year ago from Socony-Vacuum Oil Company's refinery engineering division where he was chief process engineer. Prior to his five years of service with Socony-Vacuum, he had been an engineer for E. B. Badger & Sons Co, for nine years. He worked on the design of the first commercial Houdry fixed-bed units and also saw engineering service in several foreign countries.

Dr. Claude C. Peavy

Harmon J. Monnik has been made chief of the mechanical engineering department of Houdry. William C. Dickerman will be in charge of process design. Development engineering will continue to be carried on at the Houdry laboratories near Marcus Hook, Pa., under the direction of Raymond C. Lassiat.

W. W. KEELER was elected vice president in charge of refining for Phillips Petroleum Co. at the recent annual meeting. He succeeds the late W. G. Hiatt who died April 12, 1947. Mr. Keeler has been manager of the refining department since October, 1945; he was assistant to the vice president in 1944 and technical assistant to the vice president in 1943. His election is the culmination of a 16-year career with Phillips. At various times he worked at both Kansas City and Borger refineries as a chemist, control chemist, process engineer, chief chemist, night superintendent, assistant manufacturing superintendent and chief process engineer.

Mr. Keeler started in 1924 as a member of Phillips engineering department, then worked in the Burbank Field for the gasoline department as well as the research department's laboratories at Bartlesville and Burbank. However, he was not employed continuously by Phillips until 1929 because he combined working and attending Kansas University.

During the war Mr. Keeler spent a year in Mexico as Phillips project manager during the construction of a new refinery at Mexico City for Petroleos Mexicanos. He first went to Mexico as a member of a staff of experts to appraise Pemex properties, then received the project manager assignment.

"Bill's" paternal grandfather, George Keeler, carried on negotiations with the Department of Interior which led to the drilling of the first commercial oil well in Oklahoma at Bartlesville. George Keeler was a partner in the first store at Bartlesville and also was active in the cattle business. He noticed that his cattle would not drink some of the water in the area and reported this to John Cudahy, the packer. Cudahy sent his geologist to Bartlesville which started the search for oil near the Indian Territory community. Keeler's maternal grandfather was Nelson Carr, the first white man to settle in the Bartlesville area. He built a grist mill on the Caney River in 1875. "Bill's father was a leading cattleman in the Osage area.

"Bill" attended the Bartlesville grade and high schools, then enrolled in chemical engineering at Kansas University. Halfway through college he left school to go to work, but after a few months in the oil fields decided to go back to school and study mechanical engineering.

W. W. Keeler

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DR. R. G. ATKINSON, former technical adviser to the Shamrock Oil & Gas Corporation, has accepted a position with Hydrocarbon Research, Inc., as process engineer at Trenton, N. J., correlating various pilot plant experiments and translating the results into terms of commercial operation.

TENDER FOR OIL REFINERY

(1) Tenders are invited by the Ministry of Economics, of the Government of Iraq, for the supply and erection of an Oil REFINERY at Baiji to supply the Iraqi market with the petroleum products as detailed in the "General Specifications" section of the Contract Documents.

The Refinery shall utilize crude oil from the Kirkuk oilfields which are being developed by Messrs the Iraq Petroleum Company. The annual throughput of the Refinery will be of the order of 600,000 tons.

(2) The Contract Documents may be inspected in due course at any of the following offices:—

- **a) The Ministry of Economics, Baghdad.**
- **b) The Royal Iraqi Embassy, 22 Queen's Gate, London S. W. 7**
- **c) The Royal Iraqi Embassy, Washington, D. C.**
- **d) The Royal Iraqi Consulate General, 36 Riverside Drive, New York City.**

(3) Firms desiring to tender will be required to produce a receipt for a cash deposit to the value of ID. 3,000 (Iraqi Diners three thousand) or its equivalent in sterling or U. S. Dollars to be placed at the disposal of the Government by way of earnest money. The deposit should be placed with one of the following Banks:—

- **a) The Rafidein Bank, Baghdad**
- **b) The Eastern Bank Ltd. 2/3 Crosby Square, London E.C. 3**
- **c) The Irving Trust Company, 1 Wall Street, New York 15, N. Y.**

On production of the above-mentioned receipt, they can obtain three copies of the Contract Documents and one Map from any of the above-mentioned places.

(4) Tenders must be submitted in duplicate enclosed in a sealed envelope and dispatched by registered post addressed to "The Director General of the Ministry of Economics, Baghdad," and will be received up to noon on the 26th Nov. 1947.

MINISTER OF ECONOMICS
BAGHDAD

Argentine Trade and Production

Final figures of crude oil production in Argentina in 1946 as reported by Foreign Commerce Weekly were 20,924,246 as compared with 23,316,847 in 1945. Production by fields was as follows: Comodoro Rivadavia, 14,592,085; Plaza Huinicul, 2,666,047; Mendoza, 3,049,206; Salta, 1,016,908.

Imports of petroleum and products increased from 3,658,168 barrels in 1945 to 22,547,100 barrels in 1946 and consisted principally of crude oil, which rose from 1,045,352 barrels to 7,232,000 barrels, and residual fuel oil which rose from 2,145,858 to 14,451,800 barrels. The principal sources of imports during 1946 were Netherlands West Indies, 11,132,900 barrels; Venezuela, 8,638,400 barrels; United States, 1,018,800 barrels. All of the remainder came from other South American countries with the exception of 366,000 barrels of crude oil received from Saudi Arabia.

Crude-oil runs to stills during 1946 totaled 27,673,000 barrels, of which 20,808,000 were Argentine crude and the remainder foreign. Output of refined products was as follows, in barrels: Aviation gasoline, 101,000; motor fuel, 8,366,000; kerosene, 3,345,000; distillates, 2,511,000; residual fuel oil, 9,673,000; and other products, 3,055,000.

U. S. Exports

Bureau of Mines of the Department of Interior reports exports of petroleum and its products from the United States during 1946 as 163,549,000 barrels. This is a daily average of 448,080 barrels as compared with 506,000 in 1945. Exports by products were as follows, in thousands of barrels:

Crude Oil	40,750
Motor Fuel	45,389
Kerosene	8,559
Distillate Fuel	29,358
Residual Fuel	9,486
Lubricants	23,474
Other	6,533
Total	163,549

Exports fell off sharply in January, 1947, declining to 8,524,000 barrels or 274,952 barrels daily, but in February they returned to approximately the 1946 level of 12,092,000 barrels or 431,846 barrels daily.

N. N. JONES, acting district superintendent for Humble Oil & Refining Co., in Gladewater, Texas, district, has been appointed district superintendent replacing W. C. Anderson, who died April 19.

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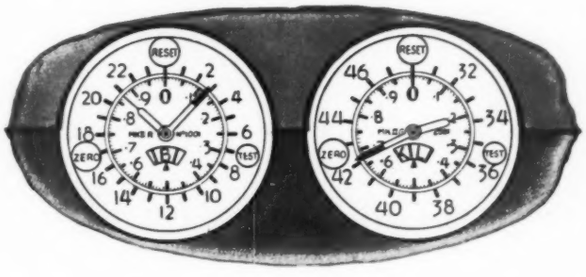

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Wyatt Official Dies

E. B. Wood, 46, sales engineer for the Wyatt Metal & Boiler Works, Houston, for the past 13 years, died April 18 at his home in Houston. Burial was in Fort Worth, his birthplace. Mr. Wood attended college in Canada and served as an aviator in World War I. Prior to joining the Wyatt organization, he was connected with Imperial Oil Ltd. and the Parkersburg Rig & Reel Co. in Venezuela and Colombia. He was an active member of the Houston Engineers Club and the Houston Chapter of Nomads.

New Research Center

A new laboratory building will be erected at El Segundo for California Research Corp. to contralize all southern California technical research and development work on petroleum products and refining processes at Standard of California's El Segundo refinery. Completion is expected early in 1948. The company's research facilities are now housed in eight separated buildings.

First Solexol Plant

The M. W. Kellogg Co. has announced that it will build its first Solexol plant for Swift & Co. at Hammond, Ind. The process to be used by Swift was developed by Kellogg for the separation of glyceride oils into fractions differing in molecular weight and structure. Kellogg engineers believe that the process will find wide application in the fats and oils fields.

Lou G. Cornish

Joins American Exploration Co.

Lou G. Cornish, who has been supervisor with the Seismograph Service Corporation, is transferring his headquarters from Tulsa to Lafayette, Louisiana, where he will join American Exploration Company, a recently acquired subsidiary of SSC. Mr. Cornish will become a vice president in charge of the interpretation of the company's over-water seismic prospecting.

Cornish was educated at the University of Missouri, Southern Methodist University and the University of Tulsa. His first experience in geophysics was in 1930 with Geophysical Service Inc. He joined Seismograph Service Corporation at the time of its organization in 1931, making him the company's oldest employee in point of service.

While with the parent company, Cornish worked up from the ranks through the positions of shooter, surveyor, computer, party chief and supervisor. In 1936 he spent a year for SSC in Romania. He is a member of the Cooperative Club and the Society of Exploration Geophysicists.

Publishes Lube Research Review

A picture story of its research program for development of improved industrial lubricants has just been published by Gulf Oil Corp. The brochure is entitled "Better Lubricants for Industry through Research." Forty-eight photographs, chiefly taken at Gulf's Harmarville laboratories, show the research devices, including pilot plants, endurance testing machines, micro-laboratory equipment, electron microscopes and spectrometers.

Consolidates Mississippi Operations

Black, Sivalls & Bryson, Inc. has consolidated its oil field equipment operations in Mississippi in the newly opened branch at Brookhaven. Ted Falls, manager of the recently closed Natchez branch, and Tom R. Sessums, will operate the Brookhaven branch.

Union Puts New Desalters on Stream

Three of the Petroleum Rectifying Company's latest design high capacity desalting units have been put on stream by the Union Oil Co. of California at its Battles Station plant near Santa Maria. The new desalters process approximately 45,000 barrels per day of 15° API Santa Maria Valley, Gato Ridge and Canyon crudes. It is the largest desalting plant in California. The three Petreco desalters are of a special high-capacity type developed for use wherever a large stream requires salt removal. This type treater has been extensively used in Eastern, Mid-Continent and Gulf Coast refineries for some years.

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The desalters take their charge from the clean crude coming into the station and the wet crude dehydrated by a battery of twenty standard Petreco electric dehydrators. The dehydrators bring the difficult treating Santa Maria Valley and Cat Canyon crudes down to pipe line B.S. and W. requirements from a wet cut of approximately 40 percent. The desalters then reduce the salt content to an acceptable refinery tolerance as specified by Union's refinery management. The entire plant features automatic controls and embodies the latest developments in the art of electrical dehydrating and desalting, incorporating heating and flow features especially suited to the handling of 15° API oil with the physical characteristics of the Santa Maria Valley crudes.

Army-Navy Courses

A 10-day petroleum indoctrination course for selected Army and Navy personnel was conducted recently by Standard Oil Company of California at its Richmond Refinery. The course included a study of manufacture and distribution as well as a two-day visit to Kettleman Hills oil field for a study of production methods. Classes consisted of government petroleum personnel stationed in the western states, Alaska and Hawaii.

Glynn Williams

Axelson Chief Engineer

J. C. Axelson, president and general manager of Axelson Manufacturing Co., has announced the appointment of Glynn Williams as chief engineer to succeed E. W. Ostrom, whose resignation was effective April 15, 1947. Mr. Williams has been with the Axelson organization since 1934, serving in various capacities in the engineering department, recently being divisional head of aircraft engineering.

W.A.A. Sells Sweeney Plant

Phillips Petroleum Company in association with a group of independent operators in Houston, Texas, has purchased the refinery at Sweeney, Texas, built in 1944 as part of the war production program. The sale price as announced by War Assets Administration was $13,000,000, or approximately 50 percent of the original construction cost.

Alamo Refining Company will operate the plant which has a rated crude capacity of 25,000 barrels daily and occupies a site of 500 acres adjoining the Old Ocean field. It was built by J. F. Pritchard & Co. to produce high-octane gasoline and fuel oil. It includes a thermal reforming plant, an H. F. alkylation unit, U.O.P. fluid cracking equipment and an isomerization unit. During the war it was operated by J. S. Abercrombie Company and Harrison Oil Company.

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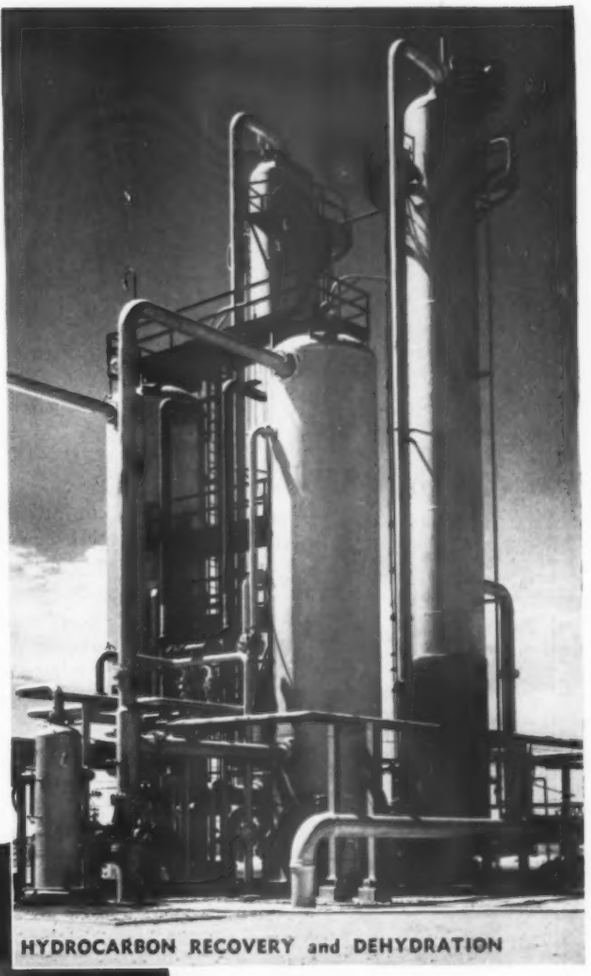

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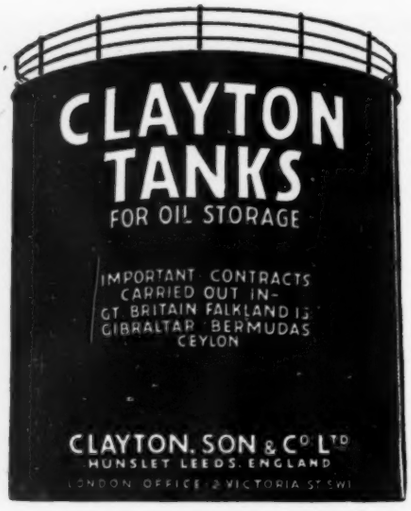

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Colonel Thompson—Prophet of Conservation

(Continued from page 45)

In his recent paper on "Octane Versus Conservation" before the Natural Gasoline Association of America and the Interstate Oil Compact Commission, the Colonel advanced the theory that the octane number of motor fuel should be frozen at 65 in the interests of conservation. He said that from 1.5 to 2.5 percent of motor fuel volume is sacrificed for each increase of one octane number. For each increase of one octane number the cost in crude oil is thus 15 million barrels, he said. This is based on the yield penalties of 20 to 30 percent suffered in reforming operations.

Before his paper was presented, a number of technical men urged the Colonel to change the 65 octane number figure to 70-72 or 72-74 as being more realistic. The Colonel stuck by his guns, however, and read the figure as 65. "It would take a college graduate with at least four years' training as a chemist, an engineer and a technician, with the aid of specialized testing equipment, to ascertain the difference in performance and horsepower of the engine when using 65 octane number on one hand as compared to using the much more expensive 80 octane on the other—providing the engine in each case has been properly adjusted for the fuel," he said. Cracking to increase gasoline yield is fine, he concedes. But when it reduces yield to improve octane number, he objects.

Clearly the Colonel has expanded his concept of conservation beyond that of saving gas and other reservoir energy to obtain maximum recovery. He now suggests that the program should "give the most miles per barrel or per pound of crude." In this new campaign the Colonel can have no Railroad Commission authority to back him up. He must rely solely on his ability as an exhorter —a field in which he also has great talent.

MEK in Tank-Car Quantities

Celanese Chemical Corp. has announced that it is now producing tank-car quantities of methyl ethyl ketone, one of the most widely used solvents in the lubricating oil, plastic and lacquer industries. In addition to its solvent power, methyl ethyl ketone possesses a higher boiling point and lower vapor pressure than acetone. Its unusual properties make it ideal as an intermediate in the manufacture of organic chemicals and dyes. It is a colorless liquid, soluble in water, alcohol and ether and miscible with oils. Celanese recently built a large plant at Bishop, Texas, to produce chemicals from LPG and natural gas.

Hortonsphere Booklet

The Chicago Bridge and Iron Company has published a new booklet, "The Hortonsphere," containing useful charts for the industry. The correct storage pressure required to prevent standing losses from volatile liquids can be read directly from one chart. There is also a chart for determining the vapor pressure of the product to be stored at a given temperature. Gaging methods are described and photographs of three typical gaging units are shown. A copy of the booklet will be sent on request.

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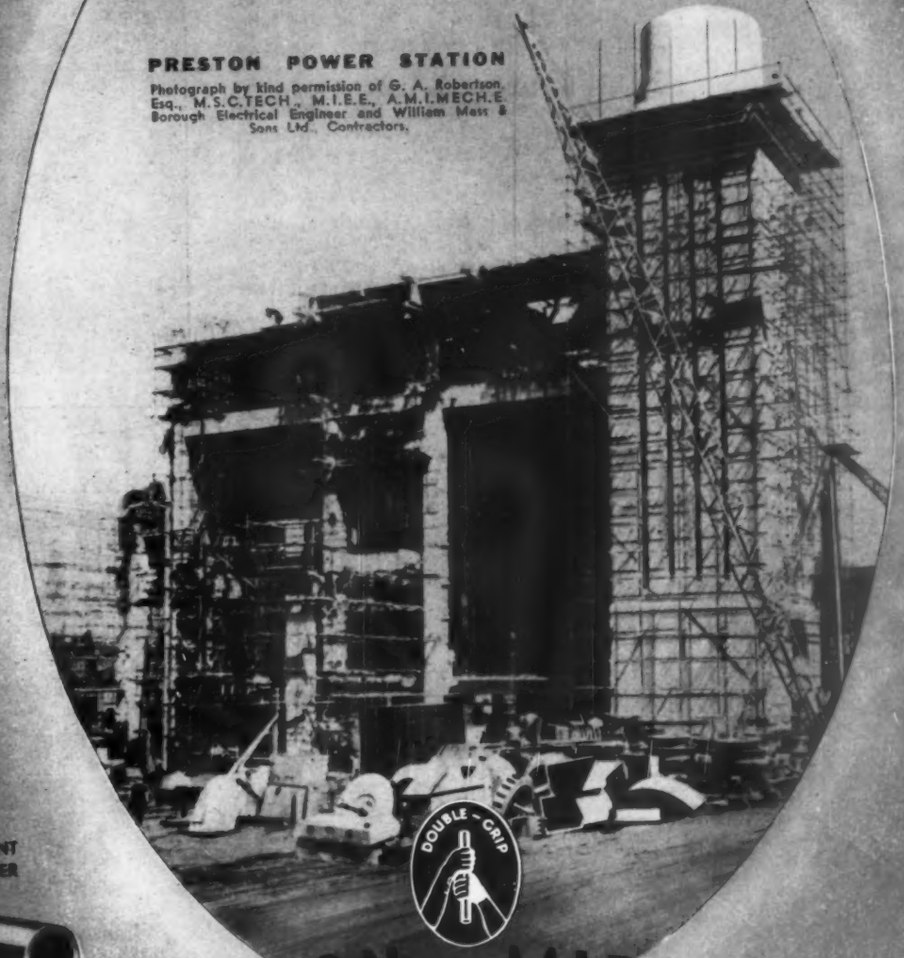

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J. L. Mathieu

Overseas Manager for Schlumberger

J. L. Mathieu, widely known among the oil men of three continents through his long connection with well surveying operations, will transfer his headquarters to Paris within the next few months and will have charge of the overseas operations of Schlumberger Well Surveying Corporation, covering the Eastern Hemisphere.

Mr. Mathieu was born in France and graduated in 1923 as mechanical engineer from the National School of Arts and Crafts. In 1930 he became a member of the Schlumberger staff in Houston, Texas. The two following years were spent in the Maracaibo Basin in Venezuela and in 1933, he returned to Houston where in 1941 he became vice president and sales manager of the Schlumberger corporation. In 1944 he was appointed vice president and general manager of Cia. Surenco-Schlumberger S. A., in Caracas.

Organize Romanian Company

Ten American corporations, all of which have had past business relations with Romania and most of which have investments there, have organized the American Roumanian Trading and Development Corporation. The company is a non-profit organization with an authorized capital of $1,000,000, and its purpose is to promote trade between the two countries through regular commercial channels. Ralph P. Bolton of Standard Oil Company (N. J.) is president of the corporation.

G. L. Kothny Dies

G. L. Kothny, vice president and general sales manager of the Sperry-Sun Well Surveying Company and prominent inventor of industrial equipment, died May 28 at Bryn Mawr Hospital where he had been a patient three weeks. He was 66. His home is on West Valley Road, Strafford, Pa.

Mr. Kothny had been with Sperry-Sun Well Surveying Company, a wholly-owned subsidiary of Sun Oil Company, since 1929. He was born in Troppau, Czechoslovakia and educated in the universities of Reichenberg and Prague.

Mr. Kothny contributed numerous articles to scientific journals and in 1920 received the Franklin Institute Medal of Merit as co-inventor of the Radojet air pump which became standard equipment for ships.

During his long career as a designing engineer, he served as consultant to industrial firms in several European countries.

H. G. DENHAM has been appointed special assistant to the president of California Texas Oil Company, Ltd. Mr. Denham's connection with the oil industry extends back to 1915 when he found employment with Socony-Vacuum Oil Company following his graduation from Brown University. In April, 1919, he was sent to China where he remained for the following ten years holding various marketing assignments and becoming main station manager. In 1927 he joined Standard Oil Company of California at its San Francisco office, serving first in the general sales manager's office and later moving to the foreign trade department where he became assistant manager in 1939. In 1943 he was elected president of California Commercial Company. From 1945 until his latest appointment, he was manager of sales for Arabian American Oil Company.

H. G. Denham

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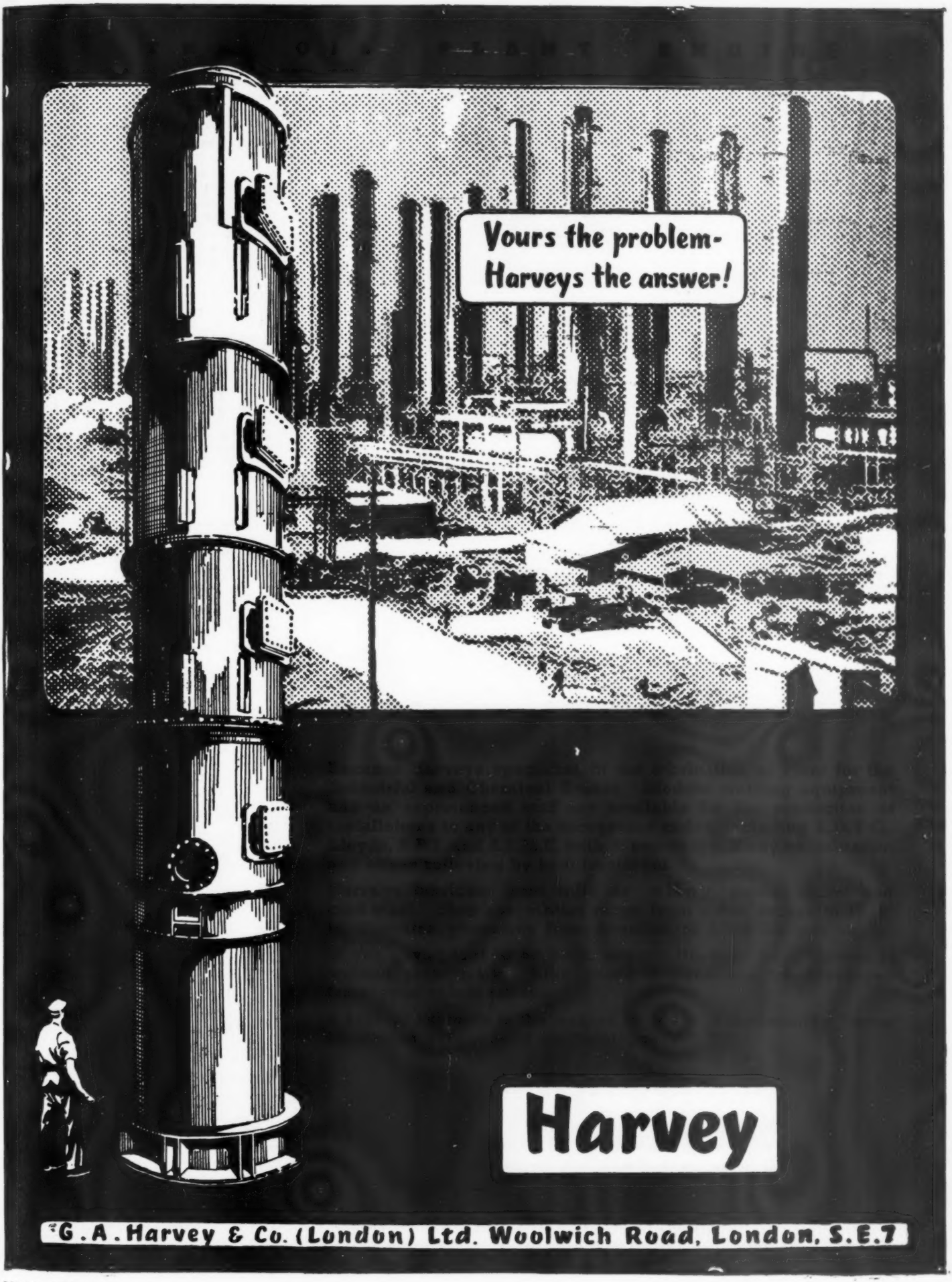
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BS & B Branch Managers Shift

Three recent shifts have been made of Black, Sivalls & Bryson, Inc. branch managers. Ed Poole, who has been manager at Salem, Illinois, has been sent to the Odessa, Texas, branch. Harrell Bruner, formerly of Carmi, Illinois, has been moved to the Salem spot, where he will assume the managership. Andy Shaw has been sent from Oklahoma City to direct the Carmi, Illinois, branch.

New A.P.I. Directors

Four members were added to the board of directors of the American Petroleum Institute at the April meeting. They are Russell Williams, Indianapolis, president of the Individually Branded Petroleum Association; R. L. Kent, Kent Oil Co., Salina, Kan.; Don Dickey, Minneapolis, president of Northwest Petroleum Association, and John L. Harper, Harper Oil Company, Long Island City, N. Y.

Pehrson Joins Ladish

H. L. Pehrson has been appointed manager of West Coast sales of Ladish forged and seamless welding pipe fittings. His offices will be at 714 West Olympic Boulevard, Los Angeles 15, Calif. Mr. Pehrson, already well known in western piping circles, has been closely associated with the valve and piping business for the past 16 years with the Reading Pratt and Cady Division of American Chain and Cable Co. The last six years of this association were spent as Southern California representative on petroleum and industrial sales.

G. W. Christopher

J. W. Owings

Youngstown Appointments

The Youngstown Sheet and Tube Co. announces the appointment of G. W. Christopher as manager of standard pipe sales, and J. W. Owings as manager of oil country tubular sales.

1947 Priestley Lectures

Dr. Alfred W. Gauger, professor of fuel technology and director of the Mineral Industries Experiment Station at Pennsylvania State College, delivered the annual Priestley lecture series at State College in April.

Subject was "Physical Chemistry and the Technology of Fuels." He discussed fuel technology and the properties of fuels, interconversion of solid, liquid and gaseous fuels, gasification of solid and liquid fuels, physical chemistry of combustion, fuels as chemical raw materials, and the nuclear power plant.

Printed copies of the lectures in an expanded form may be obtained at $2. per copy by application to Ray Dickison, Dept. of Chemistry, The Pennsylvania State College, State College, Pa.

Pol Men Meet

As part of Army week, petrol, oil and lubricant men who directed petroleum activities in World War II observed April 9 as POL Day, according to Col. Carl E. Cummings of The Texas Company and national chairman of POL. They discussed plans for the use of petroleum in future defense at luncheons held throughout the country. POL was organized at the request of the Army-Navy Petroleum Board to preserve as a unit the oil men who worked together in World War II.

Sohio To Install Cat Cracker

Plans for the modernization of its Lima refinery, involving expenditure of $10,000,000, were announced by W. T. Holliday, president of The Standard Oil Co. (Ohio). Included in the program is the construction of a new catalytic cracking unit, a gas plant, water-cooling tower, gasoline treating and blending facilities and 200,000-barrel additions to the tankage at the refinery. Capacity of the refinery is 15,000 barrels of crude oil per day. The new catalytic cracking unit will run 6,000 barrels per day.

Here's the Story
Not the full story, we admit; it does not concern itself with detailed technical information but it does illustrate the flexibility of the Callender-Hamilton Bridging System for road, rail, foot or cable-carrying bridges in any part of the World. Write for publication No. 206 J on Callender-Hamilton Bridges.
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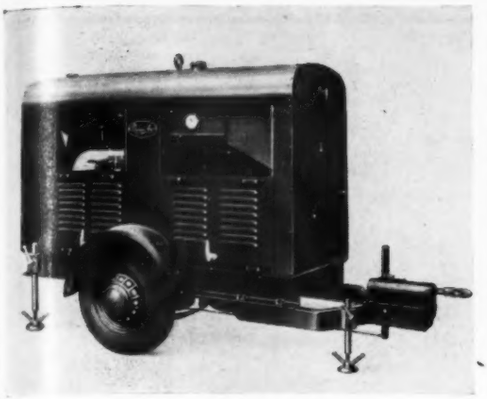


Portable Welding Unit

A self-contained welding set has been designed by Quasi-Arc Company, Ltd., Bilston, Staffordshire, England, which has been weatherproofed so that it is particularly suitable for overseas service under severe climatic conditions. The new type PE 300 incorporates a 4-cylinder gasoline engine to drive the generator to provide a current range of 20 to 30 amperes with 70 volts.

For refinery, shipyard and other on-site work, Quasi-Arc has built a remote controlled arc welding current regulator (RMR 300) which facilitates welding at some distance from the generator. With a small switch the welder can vary the current from 75 to 300 emperes according to class of work and size of electrodes.

Opens New Offices

Mid-Continent Supply Company announces the opening of the following stores: Great Bend, Kan., with V. H. Haston, store manager, and Paul K. Confer, field salesman; New Iberia, La., with W. R. Shuffield, store manager, and H. M. LeCompte, field salesman; Brookhaven, Miss., with W. M. Day, store manager, and C. R. Lowry, field salesman; Pauls Valley, Okla., with Paul Myers, store manager, and D. B. Afflack, field salesman.

D. B. HARRIS and J. A. Neath have been elected vice presidents of Humble Oil & Refining Company. H. C. Wiess, Humble president, told the meeting that in the first four months of 1947, Humble's net production had increased 10,000 barrels daily, and its refinery runs had increased 8,000 barrels daily over the average of the same period in 1946.

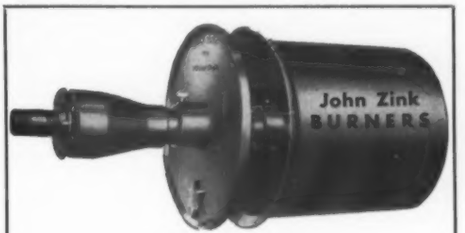
C-13 Research To Continue

A fundamental bio-chemical research project, which seeks to discover the reactions involved in the chemistry of animal and plant life, has been assigned by Sun Oil Company to the Temple University Research Institute, it was announced by Arthur E. Pew, Jr. Three and a half years' work on the problem has been conducted by the company at the Linwood, Pa., laboratories of Houdry Process Corp.

The project is based on the use of the rare carbon isotope C-13 as a tracer in reactions simulating body metabolism. Increased quantities of the isotope will be available for research when a plant capable of producing 500 grams a month is completed at Sun's Marcus Hook, Pa., refinery in mid-July.

Proposes Publicity Campaign

Dr. B. Herrera, former Minister of Labor in Colombia, has recommended an educational campaign in that country to bring about a better understanding of the oil industry. Aside from its value in informing the general public, Dr. Herrera suggests that it would tend to prevent labor disturbances or at least to reduce their frequency and severity.



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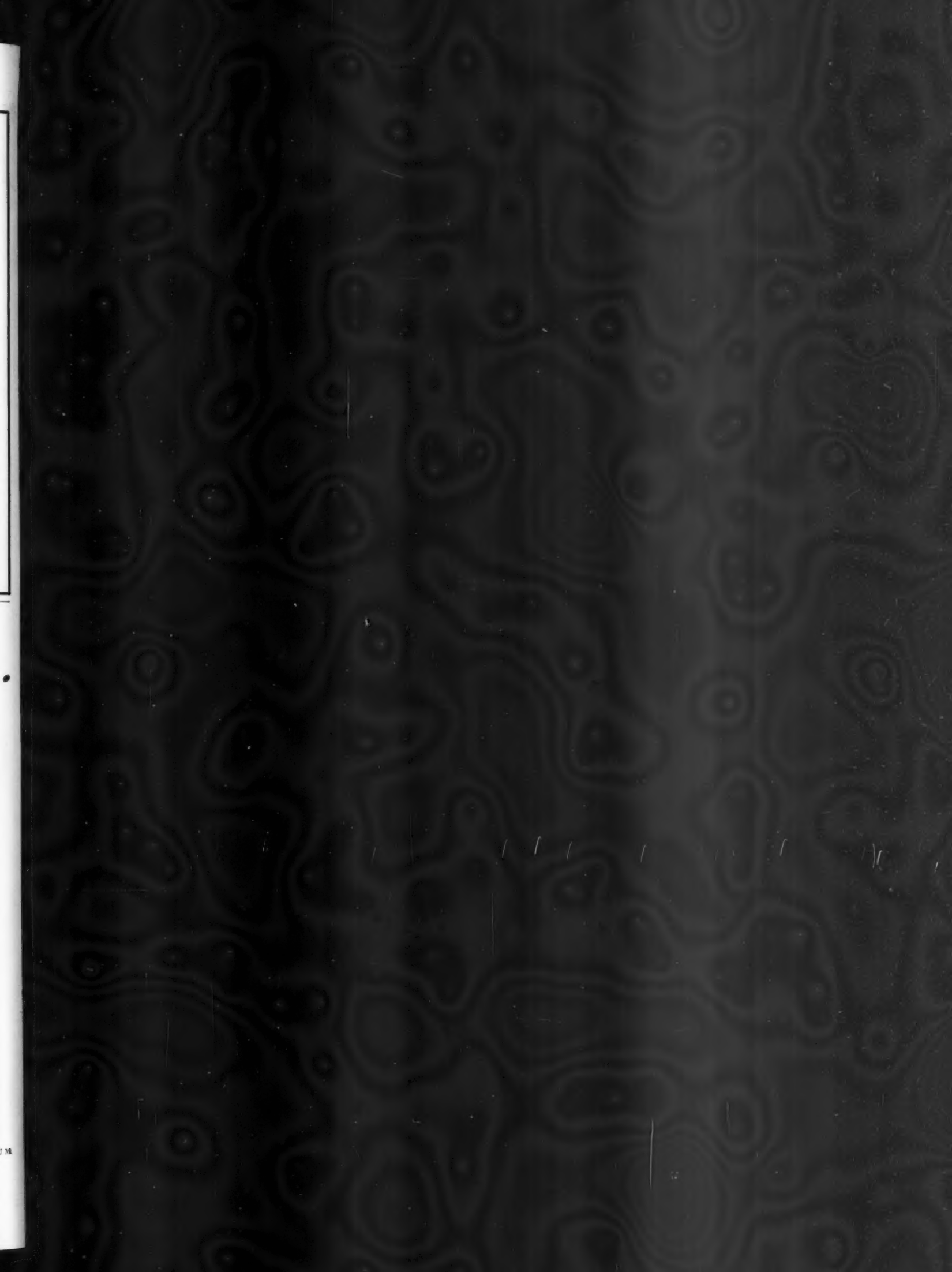
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